Vol. 37 Toronto, September 5, 1923 No. 36

Contract Record and Engineering Review

THERE will shortly be opened to traffic another fine stretch of modern Asphalt pavement—that section from Pickering to Whitby on the Kingston Road Provincial Highway. Construction work is proceeding apace in the capable hands of Johnson Bros. Company, who, working from their plant at Whitby, have already completed a considerable portion from Whitby west, part of which is shown above.

Trunk Highways like the Kingston Road, which carry traffic of all descriptions, from local picnic parties to heavy and long distance motor truck traffic, must be built for permanence. The choice of Asphalt for this and other contracts now being filled between Whitby and Toronto for the Department of Public Highways of Ontario, is testimony to the proven durability and ideal traffic qualities of Asphalt.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

IMPERIAL
Asphalt
PRODUCTS

Our illustration was taken at Whitby town limits looking west. Type of construction 1½" Sheet Asphalt, 1½" Asphalt Binder over a concrete base. The Asphalt driveway is 20 feet wide.

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A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft in diameter.

TANKS

and SILOS to Order

Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded STEEL DOUBLE COUPLING with Inside Ring Galvanized

has entirely eliminated joint leaks and has perfected WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

How Long would it Take the Fire Brigade to Get to Your Home if a Fire Started ?

We do not suggest that you send in a false alarm to get an answer to this question.

But we do suggest that you take such precautions that the chance of a fire starting is greatly lessened.

If you are building you can do a great deal to lessen the risk of fire and reduce the heavy fire loss of the Dominion.

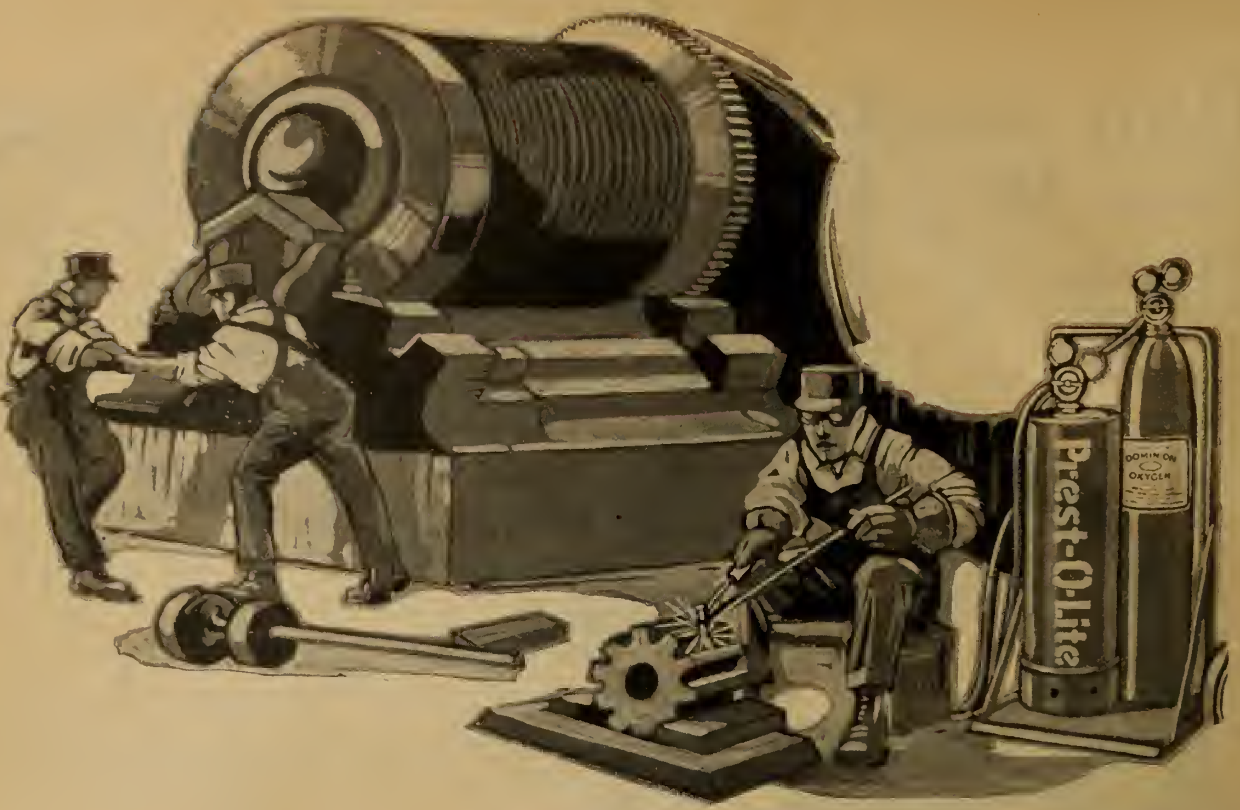
Defective flues and chimneys are one of the major causes of dwelling house fires and responsible for the heaviest property losses. The Fire Underwriters estimate that 12 per cent of all dwelling house fires originate through defective flues and chimneys.

One defective joint in a single brick chimney may be sufficient to cause a fire which will destroy your home. But if you build with Vitrified Clay Flue Linings every joint is protected, and your flues are armoured with a dense smooth lining that will not disintegrate with the action of furnace gases.

Remember that it is possible that bituminous coal will be the fuel of the future and that chimneys should be constructed that will not collect soot or be dangerous if chimney fires occur.

Dealers in every town and city stock Vitrified Clay Flue Linings. If you wish fuller information or copies of model bylaws regarding chimney construction write to

Vitrified Clay Pipe Publicity Bureau, 9 Wellington St. E., Toronto
St. Johns, P. Q. **New Glasgow, N. S.**



When Time is a Vital Factor

A BROKEN COG in a gear or a crack in the fly-wheel may tie up your plant. Breaks in machinery cause costly delays. Oxy-Acetylene welding and cutting is saving thousands of dollars yearly in effecting quick repairs.

That is when Dominion Service proves up. The purity of Dominion Oxygen and Prest-O-Lite Acetylene, assures the hottest flame and the utmost economy in fuel. The easily-handled cylinders permit the placing of the welding and cutting equipment within working distance of the job, which alone saves valuable time.

Dominion Service is equally good for the small welding and cutting shop, manufacturing plants, and big shipyards or railroads. If you use welding and cutting in your business, or contemplate the use of the oxy-acetylene process, either in production or for general repair work, it will pay you to know about Dominion Service.

Our representative will welcome the opportunity of telling you how Dominion Service will benefit your business.

Dominion
OXYGEN

Operating the Welding and Cutting Gas Division of

Prest-O-Lite Company of Canada, Limited.

DOMINION OXYGEN COMPANY LIMITED.

Prest-O-Lite
DISSOLVED ACETYLENE

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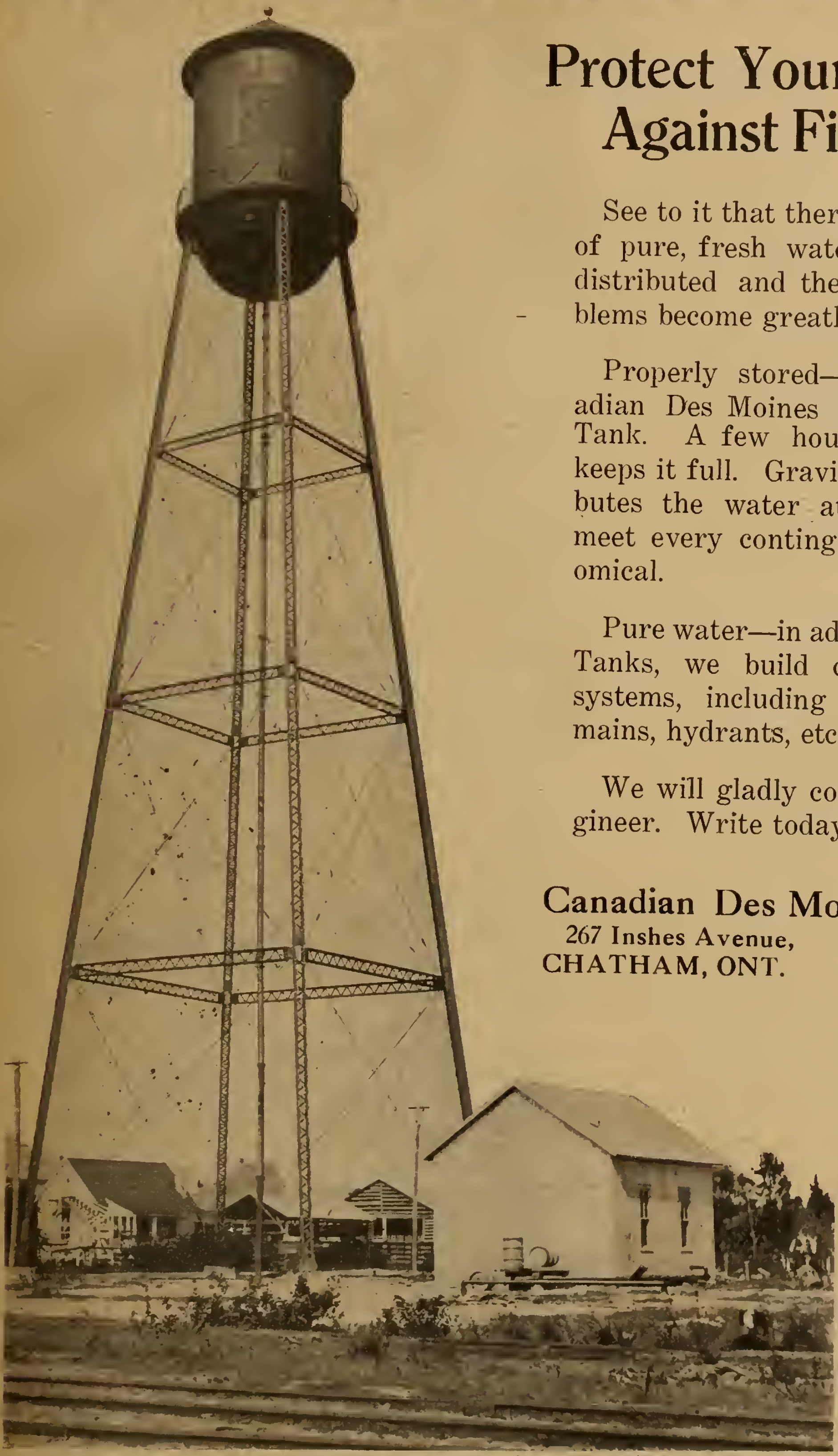

Protect Your Town Against Fire and Disease

See to it that there is an adequate supply of pure, fresh water properly stored and distributed and the fire and disease problems become greatly simplified.

Properly stored—that calls for a Canadian Des Moines Elevated Steel Water Tank. A few hours pumping each day keeps it full. Gravity does the rest, distributes the water at sufficient pressure to meet every contingency. Sure, safe, economical.

Pure water—in addition to Elevated Steel Tanks, we build complete water works systems, including filters, pump houses, mains, hydrants, etc.

We will gladly co-operate with your engineer. Write today for details.

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CHATHAM, ONT.

Dept. 67, 70 St. James St.
MONTREAL, QUE.

CANADIAN TANKS DES MOINES
TRADE MARK

CANADIAN DES MOINES

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(Continued on page 8)

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Head Office and Works: Hamilton, Canada
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Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

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  - Dennis Wire & Iron Works Co.
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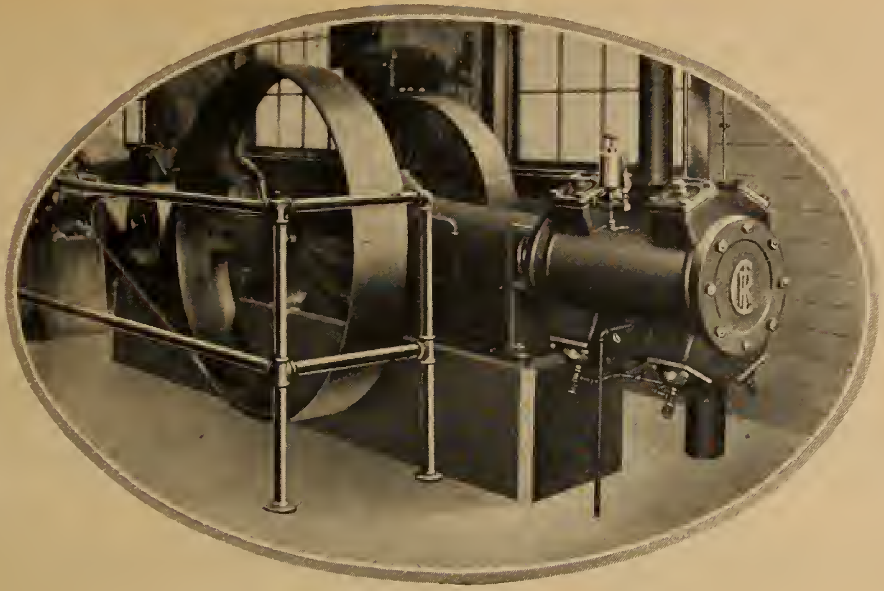

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Efficient because the lower the cost of compressing air, the greater the profit on the job.

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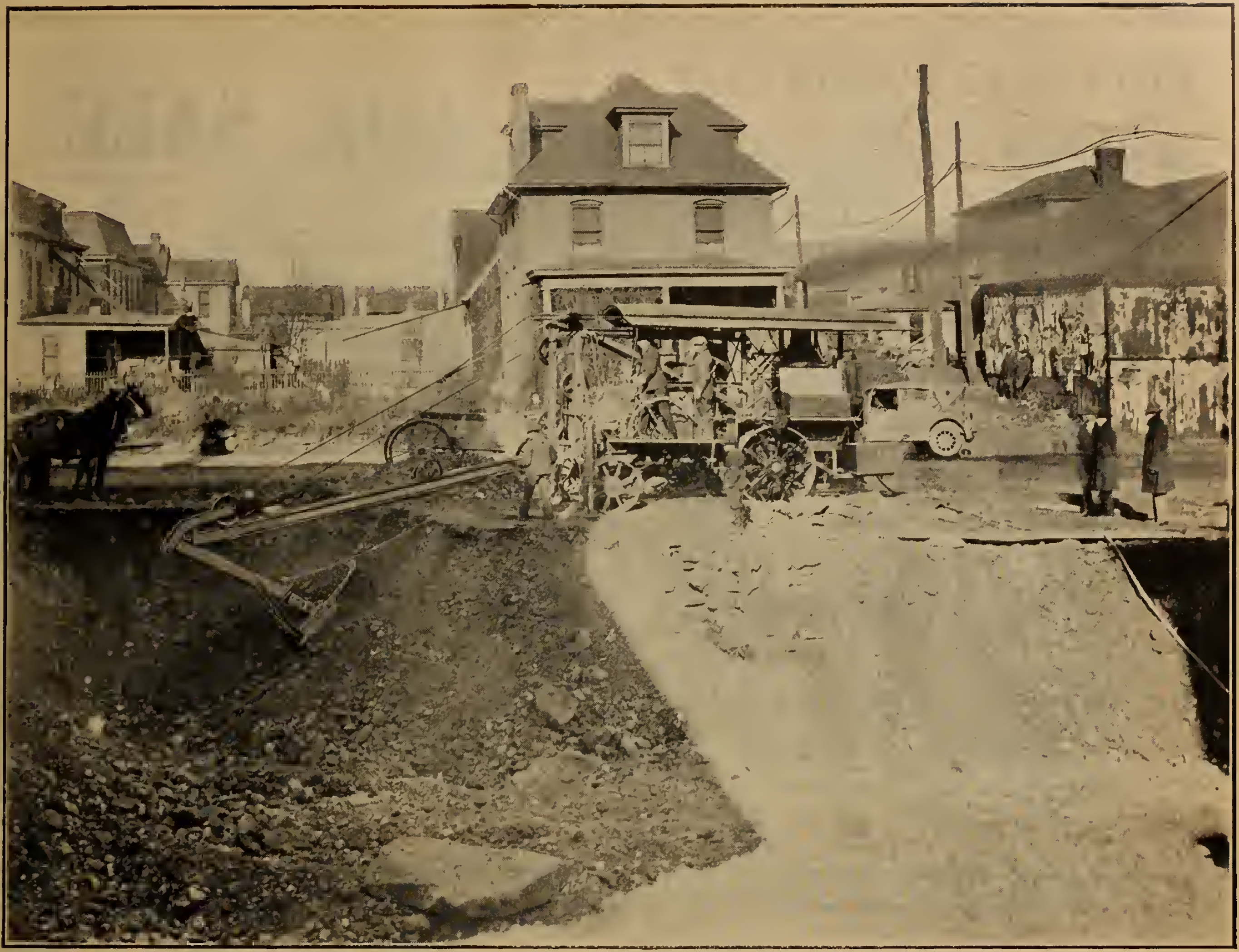

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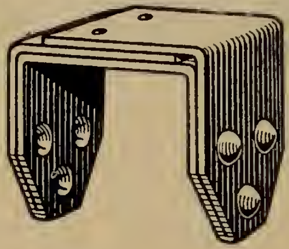

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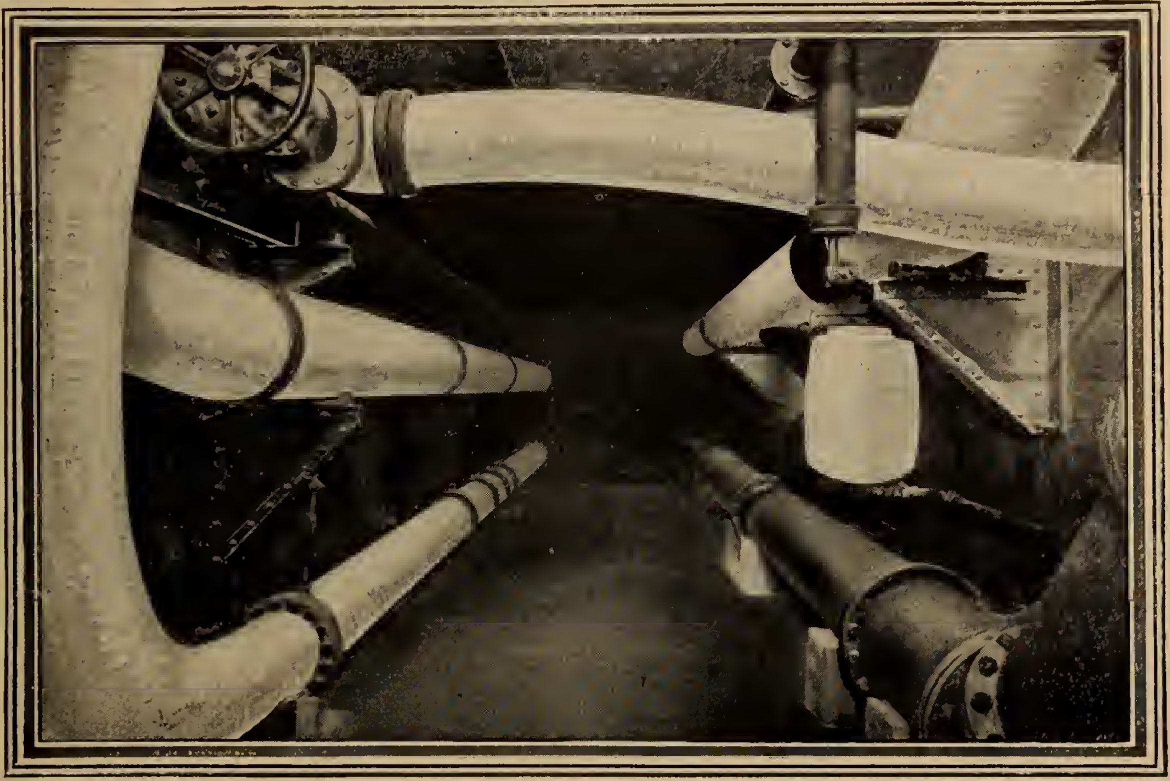

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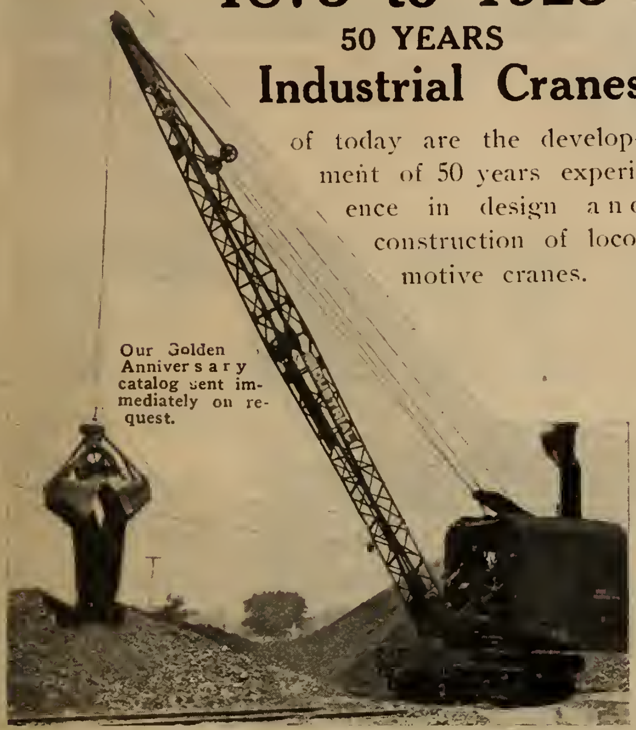

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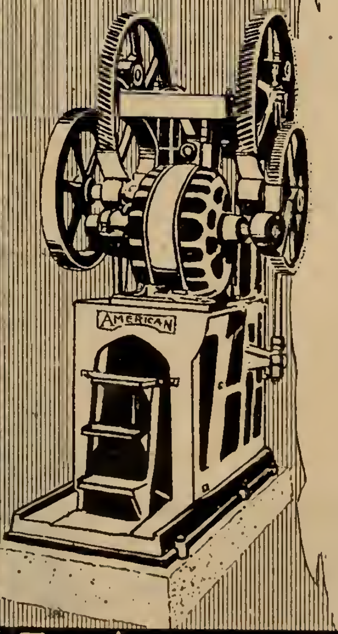

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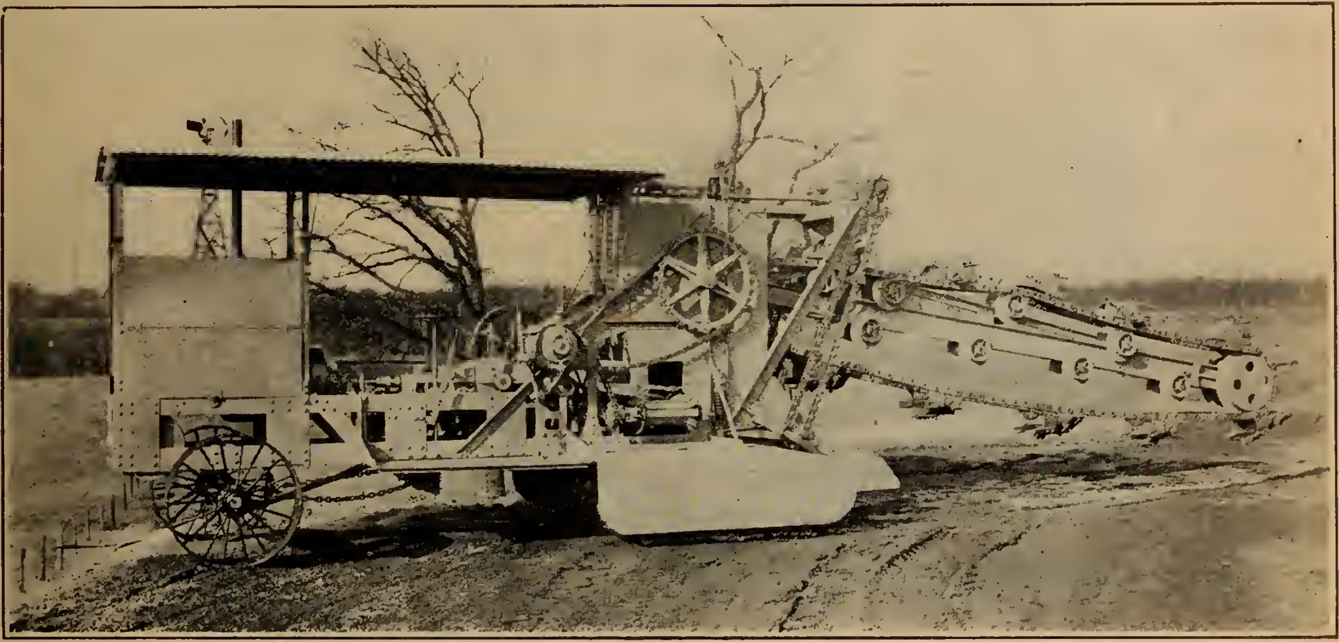

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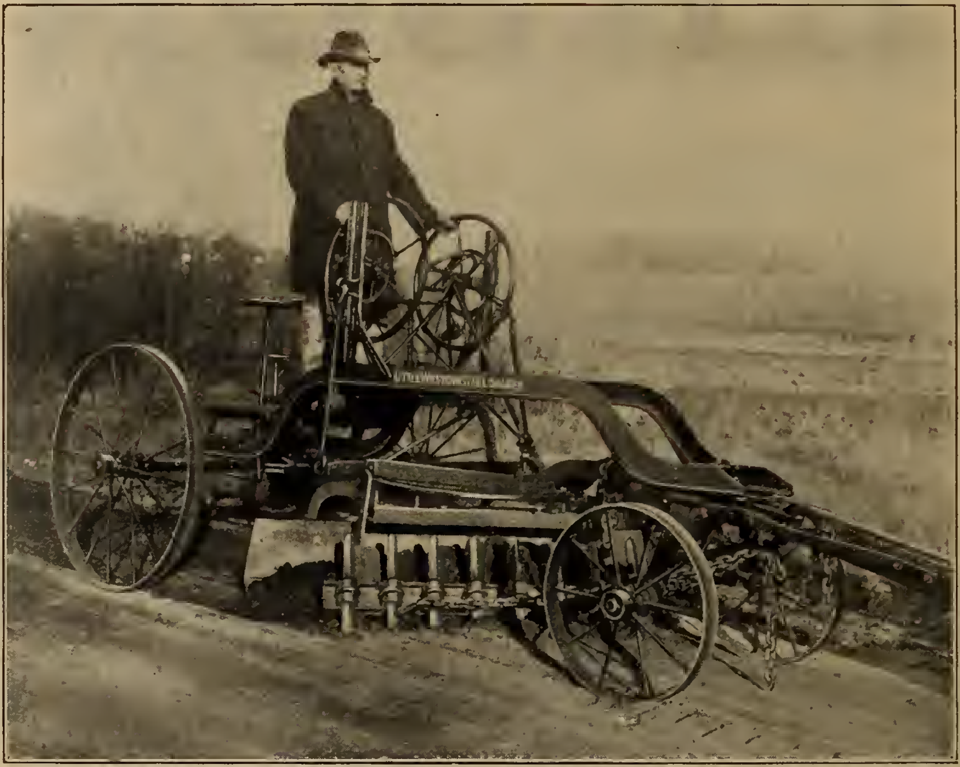

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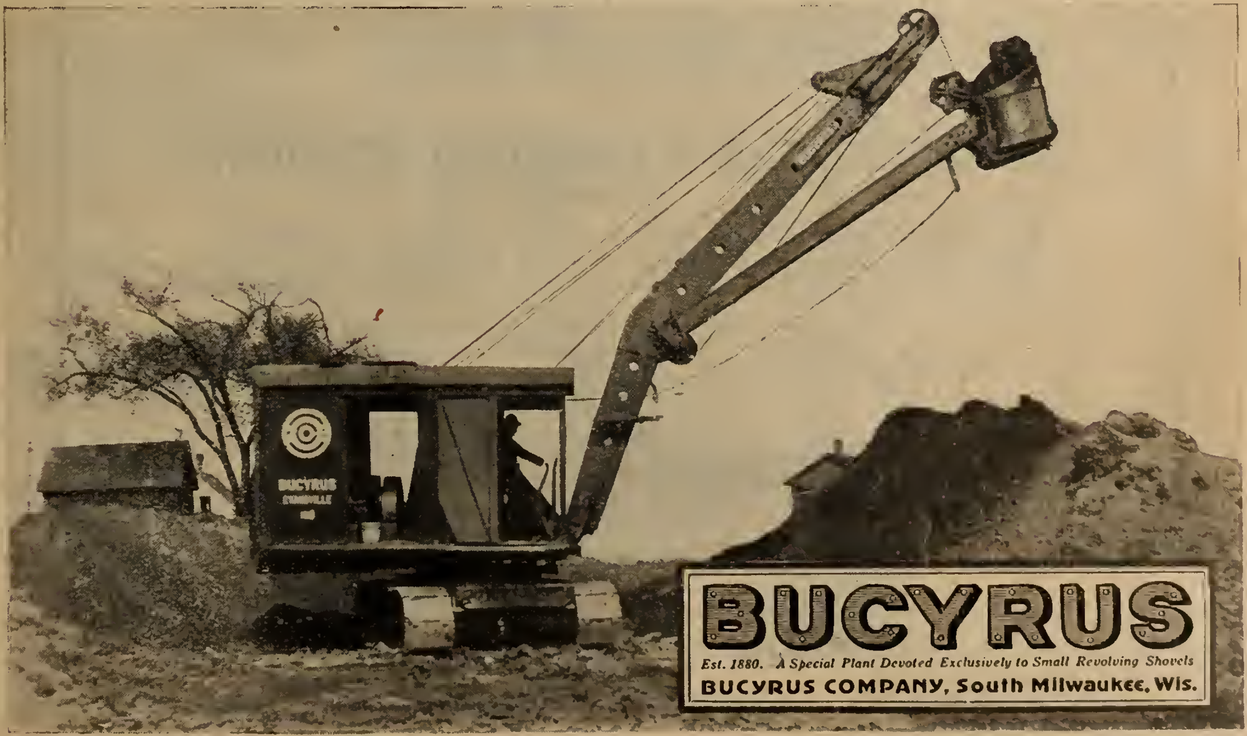

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Domtar pavement—Constant Spring Road, Jamaica, B. W. I. Built 1922

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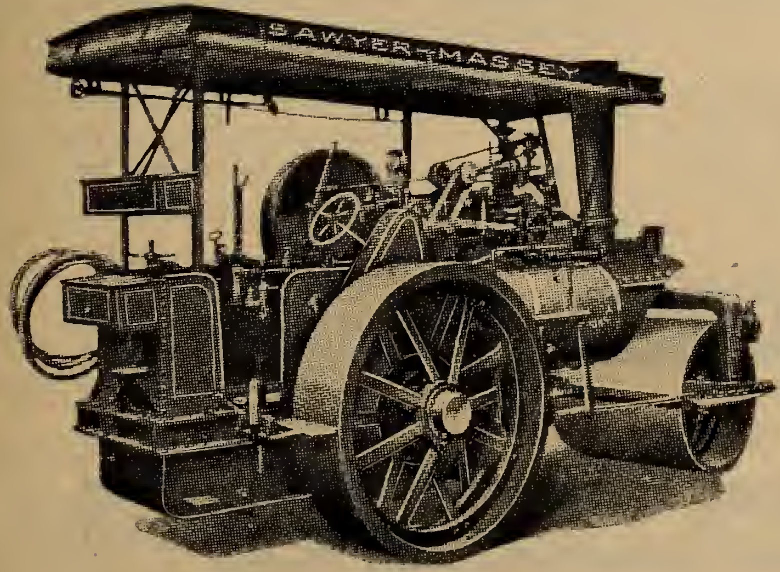

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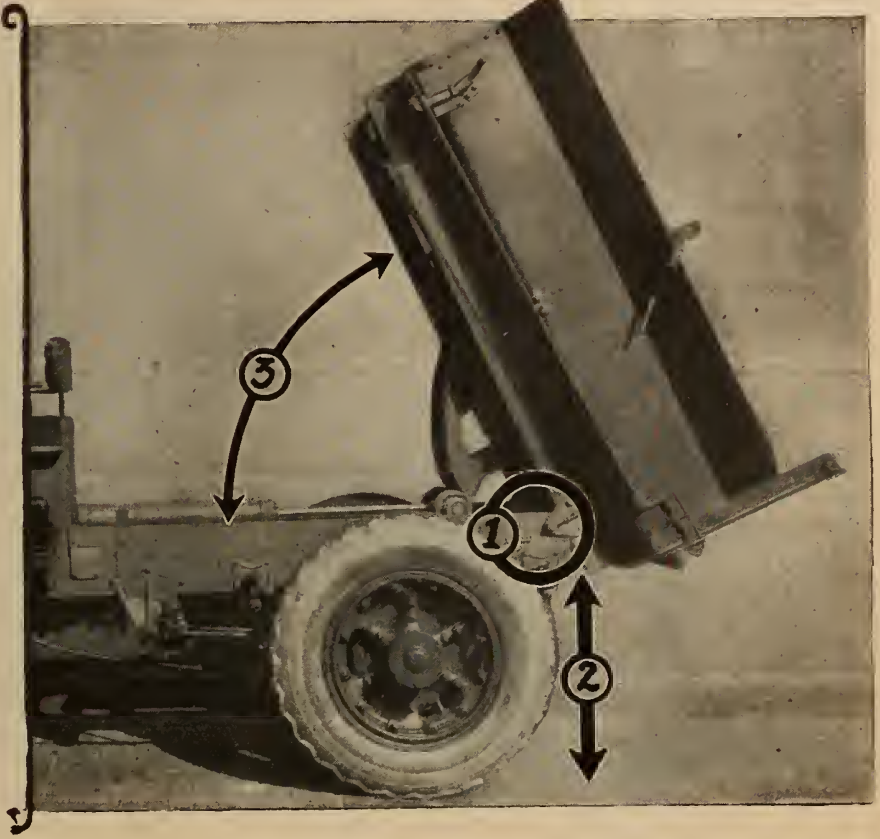

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Partiality to Local Contractors

It is only natural that a municipal body having construction work to let should favor local contractors. Civic pride and local patriotism are not elements of civic life that should be depreciated. The institutions of a town, its business houses, its professional organizations, its merchants, its banks should receive the whole-hearted support of the citizenry of the town, provided those institutions and organizations can render the service that is required and demanded of them. It is by such encouragement of local industry that towns continue to develop in size and influence. Yet there is a limit to which this "made-in-Toronto," or "made-in-Montreal," or "made-in-any-other-place" policy can be carried and that limit is the extent to which the desired service can be obtained locally at a fair price. If for the same price superior service, or what is the same thing, the same service at a lower price, can be obtained in another town, the patronage should be transferred from local firms to those that are making the better offer, wherever they may be located.

This applies to the contracting business as well as any other. Competing contractors in tendering on a piece of work are offering similar service at prices that vary according to what the bidders determine that service to be worth. While other considerations than price come into play, it is the general rule that the lowest tenderer is successful in receiving the contract. In municipal work this practice almost universally applies, and therefore, when a town council, for reasons apparently political, upsets all principles of fair procedure, it is worthy of critical comment.

The case of the town of Thorold, Ont., referred to at some length in the last issue, is not new or uncommon. Contractors, probably from time immemorial, have had to contend with favoritism of this character. Thorold's fault is not so much that of favoring a local contractor—which is perfectly justifiable when fairly carried out—as of not acting squarely and in good faith with the other contractors who spent just as much time and money in determining the value of the service they intended to render. In short, Thorold's fault was one of asking for tenders openly but making the awards locally.

The square thing for Thorold to have done if it wanted to favor local enterprise, would have been to have limited the tendering firms to those of local residence. When bids are requested from far and near, however, in all fairness to those who have gone to considerable trouble and expense in figuring the job, they should have been given equal consideration in the decision. It will be remembered that some time ago the city council of Toronto, in awarding the contract for the Coliseum, was influenced by local considerations and only saved its good name among the contracting fraternity by reconsidering its decision at the last minute and awarding the contract to the lowest tenderer—a Montreal firm. At that time the Contract Record took the stand that it was the only square thing to do to award the contract to the lowest tenderer irrespective of his place of residence, and in the case of the Thorold incident, we see no reason to justify a change of attitude. The continued practice of unfair partiality on the part of municipal councils will only make reliable contractors distrustful of the town's integrity and will keep them from offering their services under any conditions.

Giving Local Contractors a Preference

Among the readers of the Contract Record who have commented on the article in last week's issue entitled "Political Juggling of Municipal Tenders" is Mr. T. S. Scott, city manager and engineer of Niagara Falls, Ont. His letter, which is printed on another page, brings up, among a number of interesting points, a suggestion that local tenderers on municipal construction work be given an advantage over outside tenderers to the extent of, say, one or two per cent. This means that if the out-of-town bidder should be low, but less than one or two per

No. 97

Canada's Engineers—H. T. Crosbie

It is quite remarkable how, in spite of the ups and downs which have characterized the West, especially in the past few years, the city and town engineers have not shifted very much. In some towns, of course, the pressure of hard times has required a curtailment of expenditures and very frequently the engineering departments have been abolished and the engineers left to seek other appointments. But taking the cities of the West as a whole, there seems to have been less transferring than in the East. Take Yorkton, Sask., for example. In this town, H. T. Crosbie has been engineer for eleven years, having received his present appointment in 1912. He was born in Kerry county, Ireland, in 1876 and received his early training in Glasgow, Scotland. His engineering knowledge was acquired through apprenticeship with a civil and mining engineering office. In 1902 he came to Canada and was employed in railway construction in Nova Scotia until his appointment to Yorkton. Mr. Crosbie has a fighting instinct, apparently, for he served in the South African war, and in the Great War as lieutenant in the Canadian Engineers and in railway troops. He is a member of the Engineering Institute of Canada.

Mr. H. T. Crosbie

cent. lower than the lowest responsible tenderer, the latter would be awarded the contract. On the other hand, were the difference greater than the stipulated percentage, the contract would go, without question, to the outside contractor. Mr. Scott in suggesting this scheme, has in mind, of course, the desirability of encouraging local enterprise by offering a slight preference, and at the same time, giving outside contractors an almost equal chance with their local competitors.

The success of any scheme of this sort would depend on two factors: (1) The adoption of a very small differential, generally not more than one or two per cent., and (2) the clear enunciation of this preference when the tenders are called. It has been pointed out that a municipality calling tenders has a perfect right to select its bidders or otherwise limit the number of tenders, provided—and this is where most of the perplexities arise—the nature of the selection or limitation is stipulated in the call. Where unrestricted tenders are called, the only square procedure on opening the bids is to award the contract impartially and indiscriminately. If, however, a preferential treatment is to be meted out to local contractors, the inclusion of a statement to that effect in the call for tenders will put the onus on contractors to take consideration of that fact in their bids. If outside contractors do not care to grant this preference to competitors, they do not have to bid. By many contractors a one or two per cent. preference in favor of local tenderers would not be considered an undue discrimination. Others, however, would prefer to compete only on an equal basis. But when they do compete in that way they do not want to have a preference shown after the tenders are closed and local influences have had a chance to work on the sympathies and civic pride of the officials who are responsible for awarding the contract.

The Obligation of the Highway Department to Keep the Public Sold on Highways

By H. E. HILTS

The total yearly volume of sales of a provincial or state highway department to the people of a province or a state is in the millions. Can we gather any light by comparing this average department with an efficient corporation doing this gross business a year? Does the corporation spend money to make sales, does it spend money to create desire for goods, does it spend a conservative sum for research and for increasing the efficiency of both the employee and the plant, and when all is said and done are these sums conservative with the ends achieved? You will say yes. Analyze the municipal, county or provincial highway department. Does it usually make any effort, not to spend money for publicity purposes, but to create desire for roads through channels that are opened freely to them, does it allow in its budget anything for research or refined design practice, or does it organize for efficient publicity work? Most of us will admit broadly—no.

Enthusiasm must be created for our work, our job and the things yet to be accomplished, because in the end it is the spark of enthusiasm that sells or builds or creates great enterprises.

New Type of Motor for Driving Pumps

Particularly Advantageous for Waterworks and Sewage Use on Account of the Superior Starting Characteristics—Cheaper Operating Cost of the Super-Synchronous Type

By L. F. ADAMS

Power and Mining Engineering Department, General Electric Co., Schenectady, N.Y.

Recent advance in the design and application of motors for use with pumps merits the attention of all connected with water and sewage systems. I assume that all of you are familiar with the direct current constant and varying or adjustable speed motors for driving reciprocating and centrifugal pumps. Also you are no doubt acquainted with the common squirrel cage induction motor for constant speed drive and the slip ring induction motor for either constant or varying speed drive. However, it is doubtful if many realize the possibilities of the synchronous motor for constant speed drive or know anything about the brush shifting polyphase motor for varying speed drive. These types of motors offer advantages that should receive your consideration.

Low Power Factor of Induction Motors

While the induction motor has been and still is a very satisfactory motor for pump drive, it has one bad feature, that is, low power factor. This means extra losses incurred by transmitting the excitation to the load and extra investment in larger generators, transformers, and power lines to carry the excitation. Many of the power supply companies are now insisting that the power factor must be a certain amount and the power bill is increased if the power factor falls below this fixed value while on the other hand a bonus in some cases is given if the power factor is higher. One of the large companies furnishing power has a clause in its contract as follows:

"The rates set forth in the preceding tariff are based upon the maintenance by the consumer of an average power factor of 85 per cent for each month, as shown by integrating instruments. When the average monthly power factor is above or below 85 per cent, the kilowatt hours as metered, will, for billing purposes, be multiplied by the following constants."

Instead of giving a tabulation of constants I will interpret them with an example. If power factor is .5 the number of kilowatts billed will be about one-third larger than those actually metered, whereas if the power factor is unity, the number of kilowatts billed will be 5 per cent less than those actually metered. Under such contracts it is important to keep the power factor as high as possible. The same conditions exist and the same recommendations apply to those plants that generate their own power instead of buying it.

The power factor could be corrected by various means but wherever possible, it is better to avoid poor power factor by the use of synchronous motors.

Without going into details it is sufficient to say that the development through which the self-starting synchronous motor has passed during recent years has made this type of machine admirably suitable for constant speed pump drives. Especially is this true for the centrifugal pump, that is usually started with the discharge valve closed requiring usually not over 30% starting torque and 50 to 60% pull in torque. Motors for this service are designed to develop a starting torque of 50% of full load torque with the 70% compensator tap and pull in torque of 50% on the 70% compensator tap. Greater pull in torque will be obtained if full voltage is applied to the motor with the field switch open.

Starting Pumps With Synchronous Motors

In some applications it is desirable to start with the discharge valve open thereby requiring approximately full load pull in torque. In the past a magnetic clutch, which is expensive and requires considerable space, has been placed between the synchronous motor and the pump, and this made it possible to start the motor without load and then accelerate the pump by means of the clutch. However, synchronous motors are now built with adequate pull in torque and with such the magnetic clutch is no longer necessary.

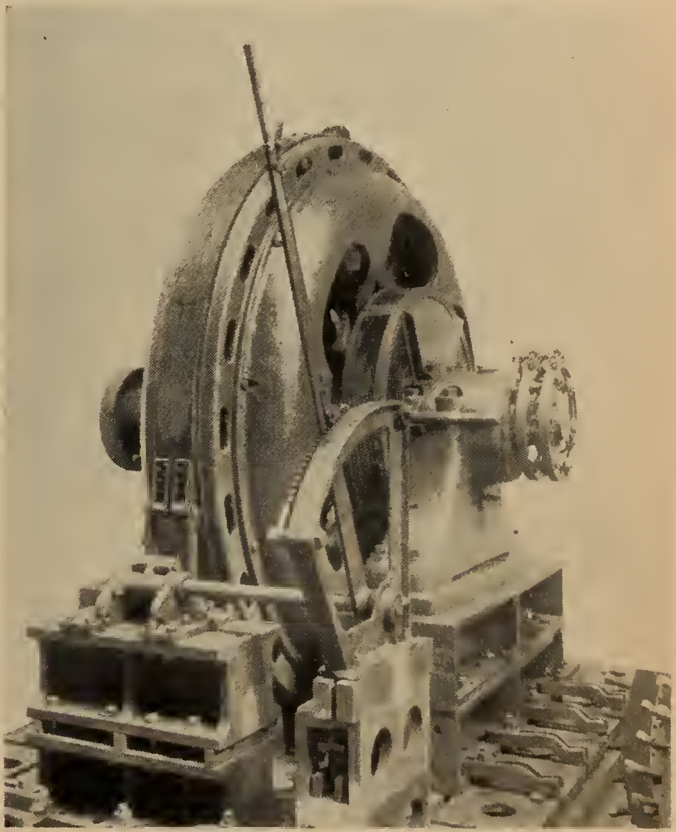


Fig. 1—A super-synchronous motor rated as 450 h. p. at 187.5 r. p. m.

Synchronous motors are also used for direct connection to reciprocating pumps. It is usually possible to place sufficient weight in the rotor of the synchronous unit so that no extra fly wheel is necessary. For such pumps full sized by-passes must be

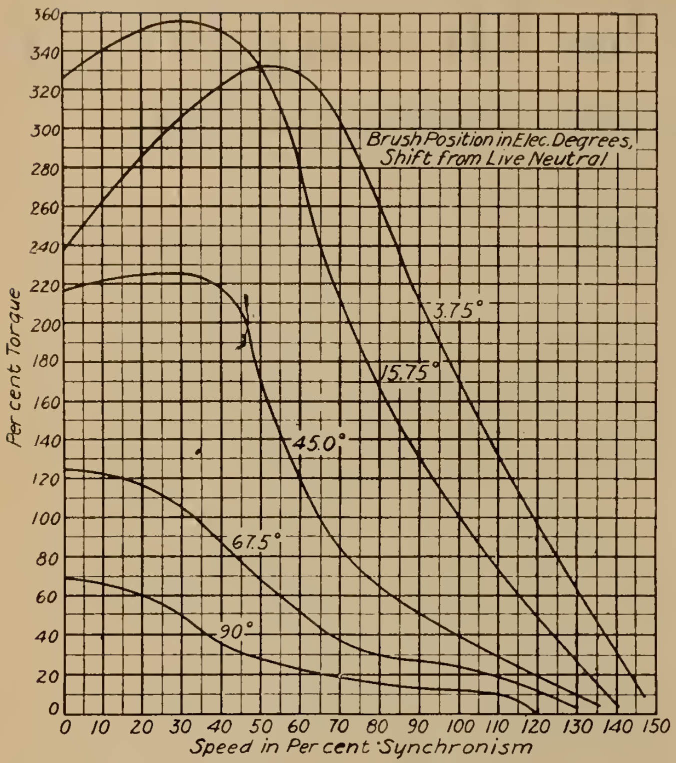


Fig. 3—Typical speed-torque curves of the brush-shifting motor for various positions of the brushes

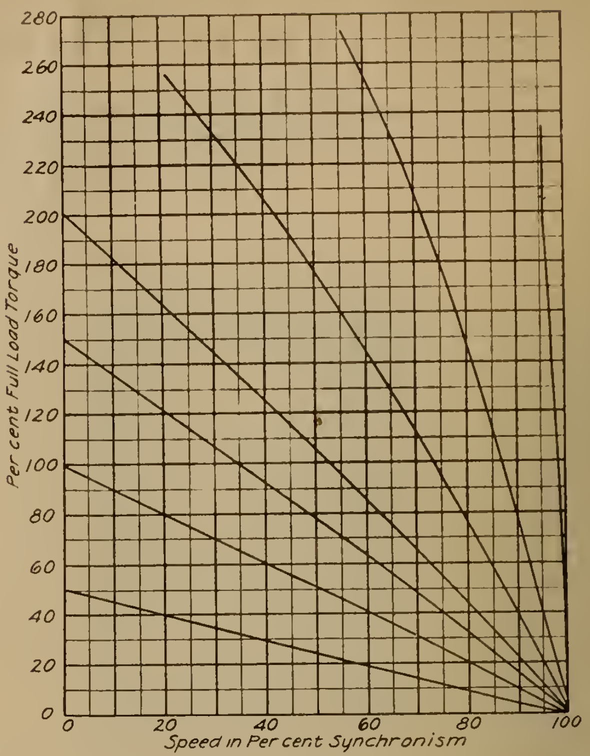
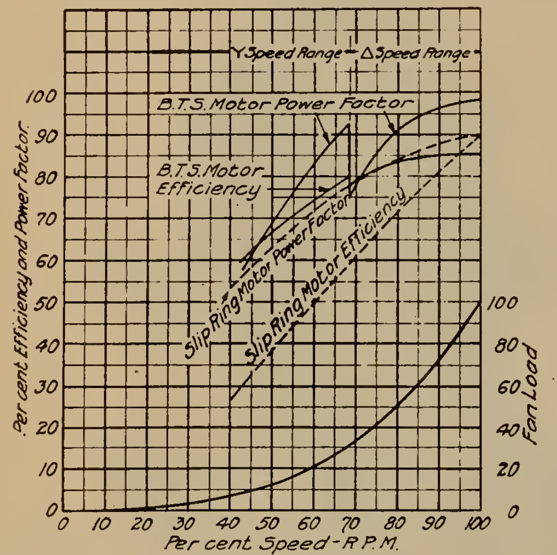


Fig. 4—Slip ring motor speed-torque curves with various amounts of resistance in the rotor circuit



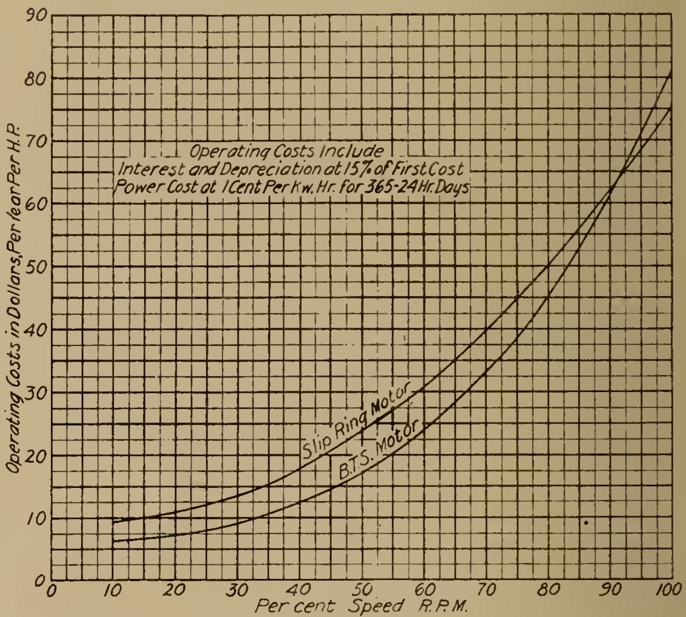


Fig. 7—Comparative operating costs for BTS motors and slip ring motors as affected by the operating speed

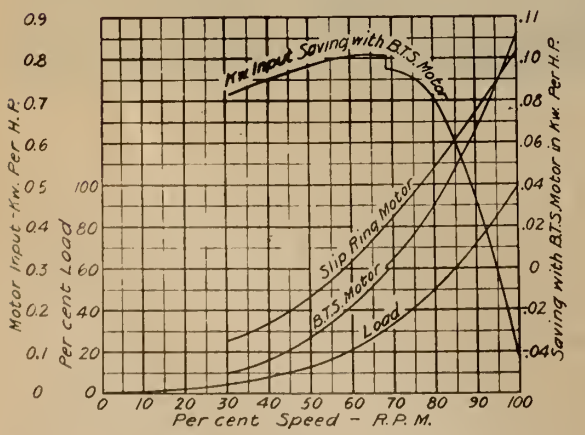
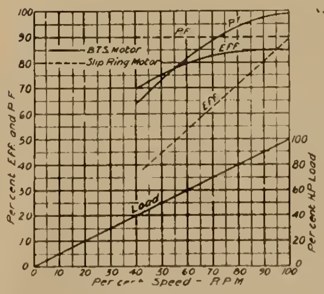


Fig. 5—Typical comparative efficiency and Power factor curves of BTS and slip ring motors under fan load

Fig. 6—Comparative kilowatt input per horsepower for BTS motors and slip ring motors driving a fan load



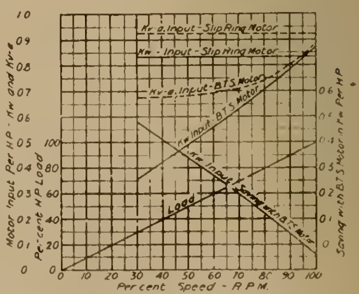


Fig. 8—Comparative efficiency and power factor of BTS motors and slip ring motors driving constant torque loads

Fig. 9—Comparative kilowatt and kilovolt input per horsepower for BTS motors and slip ring motors driving a constant torque load

furnished in order to reduce the starting torque to a reasonable value.

The synchronous motor may be started either by hand or by remote or automatic control. The motor may be designed for unity power factor or it may be made larger in order to give additional power factor correction thereby compensating for low power factor caused by induction in the station. Naturally the more correction desired the larger the motor and the greater the loss.

Because the induction motor could give very high starting torque it has been necessary to use it wherever the synchronous motor, because of its better power factor, would have been chosen if a high torque synchronous motor was available. A synchronous motor of special mechanical construction, which gives it a starting torque far in excess of any heretofore attained is now available and is particularly fitted for centrifugal and reciprocating pumps with discharge valve open or by-pass omitted, for air compressors omitting unloading values, vacuum pumps, etc.

New Motor For Pump Use

The electrical construction and essential dimensions of this motor are identical with the standard synchronous motor of the same rating. The special mechanical features (Fig. 1) include the suspension of the armature (starter) so that it can rotate during the starting period. Hollow journal extensions on the end shields are carried by bearings at the inner ends of the standards which carry the motor shaft. The periphery of the frame is machined for a braking surface and is fitted with the standard brake band lever and quadrant of mine hoist and cableway practice. The current is taken to the armature winding through rings which are normally stationary.

When starting with load, the brake is released, the armature is energized and comes up to induction motor speed. The field (rotor is then energized and the armature comes to synchronous speed. Now by applying the brake the armature can be slowed down which results in the starting and speeding up of the field and attached load. The acceleration proceeds to synchronism proportionally as the armature is brought to rest. The brake is locked and the unit has become a normal synchronous motor.

Throughout the acceleration of the field from zero to synchronism the motor is able to apply torque to the connected load several times greater than its normal full load torque.

The current drawn during starting bears the same relation to the full load current as the starting torque required bears to the full load torque. That is, a starting torque of 125% full load torque will draw 125 per cent of full load current from the line.

Heretofore, when synchronous motors have been connected to loads that could not be relieved during starting it has been necessary to interpose two extra bearings and a clutch of some sort that would allow the motor to come up to synchronous speed while disconnected (Fig. 2). The cost of these extra fittings, their weight, the careful alignment required for a four-bearing set and the extra room taken up, have been serious handicaps working against the use of this otherwise very desirable type of motor.

The designer being freed from the consideration of starting torque can accentuate the other desirable motor characteristics and can secure the desired rating in smaller dimensions.

There is a progressive practice in electric drives tending to reduce motor speeds in order to do away with part or all of the speed reducing devices heretofore employed. This tendency toward lower speeds makes induction motors less and less desirable because of the greatly reduced power-factor and efficiency. The efficiency and power-factor of the super-synchronous motor compares with like characteristicc of an induction motor as follows:

RATING 450 h. p., 187 r. p. m., 2200 volt

Super-synchronous motor		Induction Motor
93.5 per cent	Efficiency	89.9 per cent
Unity	Power-Factor	70 per cent

Both the synchronous and super-synchronous types of motors are constant speed motors. Some times, however, it is desirable and necessary to use vary speed pumps requiring varying speed motor. In the past the slip ring induction motor with secondary resistance control through a limited number of steps resulting in considerable loss of energy has been the only alternating current motor available. The demand for a motor having speed regulation over a wide range with small increments and with good efficiency over this speed range led to the development of the adjustable varying speed, brush shifting, single-phase and polyphase motors.

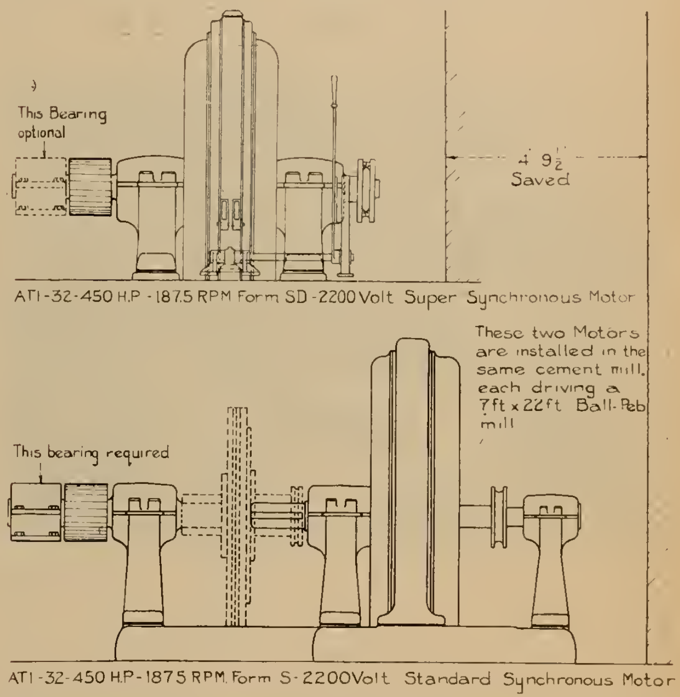

This Bearing optional
4' 9½" Saved
ATI-32-450 H.P - 187.5 RPM Form SD - 2200 Volt Super Synchronous Motor
These two Motors are installed in the same cement mill, each driving a 7ft x 22ft Ball-Peb mill
This bearing required
ATI-32-450 H.P - 187.5 RPM. Form S - 2200 Volt Standard Synchronous Motor

Fig. 2—The relative overall lengths of the super synchronous motor and the standard synchronous motor with the extra bearings and clutch necessary for any but the lightest starting duty

The motor consists of a stationary member or stator, a rotating member or rotor, and a transformer connecting the rotor in series with the stator.

The stator has distributed winding and is similar to that of the ordinary induction motor. The stator of an induction motor having the same number of poles, horsepower, voltage and frequency can be used without change for numerous ratings.

The rotor is in appearance and design essentially like that of a direct-current motor or generator, except that the armature voltage is considerably lower.

The rotor transformer is simply a series transformer with the primary in series with the stator of the motor and the secondary connected to the rotor through the brushes and commutator. This transformer not only supplies a lower commutator voltage but by its ability to become saturated limits the no load speed of the motor to a safe value. This limit is approximately 150 per cent speed.

The change in speed is obtained by shifting the brushes. In a certain brush position the fluxes from the stator and rotor so combine that no torque is produced. Shifting the brush position slightly, results in a torque- producing flux, which causes rotation. As the shift is increased the resulting torque-producing flux continues to enlarge and the speed becomes higher.

The maximum capacity for which these motors can be built is limited by commutating conditions. It has been found by experience that a limit of 30 h.p. per pole for 60 cycle motors and 70 h.p. per pole for 25-cycle motors may be used for rough approximations. This rule of thumb gives a limit of about 175 h.p. for 1,200 r.p.m. motors and 350 h.p. for 600 r.p.m. motors.

Comparative Characteristics

The speed torque curves of Fig. 3 show that the characteristics of this motor compare favorably with those of slip ring induction motors having secondary resistance control (Fig. 4). Wherever a slip ring induction motor is applicable for adjustable varying speed service the brush shifting motor may be applied, and in addition to having similar series characteristics it provides an infinite number of speed points. For centrifugal pumps, fans, etc., where the torque decreases rapidly with the speed, stable conditions exist at all speeds practically down to standstill.

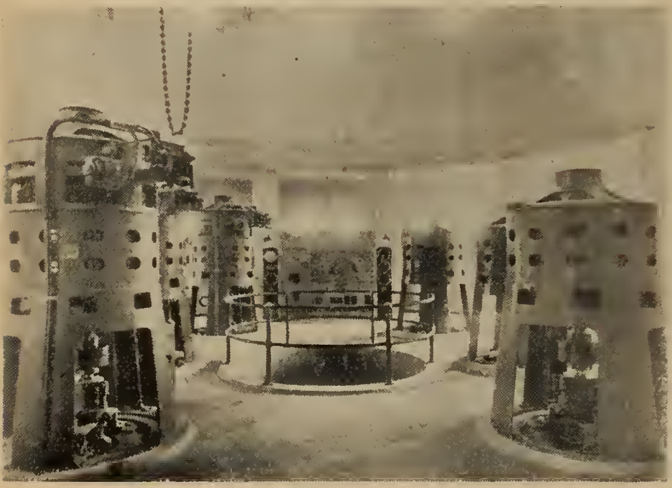


Fig. 10—Three 150 h.p., 480 r.p.m., 2200 volt, varying-speed brush-shifting motors and three 100 h.p., 400 r.p.m., 2200 volt, constant-speed squirrel cage motors with master control panel. Sewage pumping plant, Albany, N.Y.

Typical comparative efficiency and power factor curves for the brush shifting and slip ring motors when driving a fan load or similar loads such as pumps are given in fig.5. One hundred per cent speed for the brush shifting motor is equal to 12½ per cent above synchronism, while for the induction motor it equals full load speed, which is approximately 96 per cent of synchronism. This comparison assumes that the motors are driving equal loads but that the machine for the slip ring motor is designed for a slightly lower speed. At 100 per cent speed the slip ring motor efficiency is slightly higher but as the speed decreases the loss in the secondary resistors causes the efficiency to drop off rapidly.

The break in the curves is due to changing the motor connections from delta to Y. Changing to the Y-connection is equivalent to a voltage reduction, and, as is evidenced by the great increase in power factor, results in decreasing the magnetizing current. In most cases, for loads of this kind the changeover should be at 70 per cent speed . When this change is made a different speed is obtained for the same brush setting.

The benefit of this higher efficiency is more clearly shown by Fig. 6 which gives the comparative kilowatt input per horsepower when operating at different speeds. The saving in kilowatt input per horsepower by using the brush shifting motor instead of the slip ring induction motor is also shown. If the motors in question are 100 h.p. the kilowatt saving (Fig. 6) at 75 per cent will equal 100 x 0.01, or 9.1 kilowatts. The saving per year at this speed, assuming 365 twenty-four hour days (8,760 hrs.), will be 79,700 kw.h.

By estimating in detail the operating speed cycle that is required a more representative power saving may be calculated as follows: Assume a 100 h.p. fan unit having a speed cycle of operation each day equivalent to:

4 hours run at 100 per cent speed
8 hours run at 85 per cent speed
8 hours run at 65 per cent speed
4 huors run at 60 per cent speed

From Fig. 6:

Hours	% Speed		Kw.-hrs.
4	100	4 x 100 x .045=	18.0 loss
8	85	8 x 100 x .058=	46.4 saving
8	65	8 x 100 x .102=	81.6 saving
4	50	4 x 100 x .095=	38.0 saving

Total kw-hrs. saved per day 148.0
Total kw-hrs. saved per day 54,000

Large Savings

At one cent per kw.h. this equals a saving of $540 per year, which capitalized at 15 per cent for interest and depreciation, etc., justifies an additional expenditure of $3,600 for the BTS equipment. This is a conservative estimate, for in the majority of cases the cost of power exceeds one cent per kw.h.; but even so the additional expenditure that is justified would practically cover the complete charge for a new motor and therefore warrant the use of the brush shifting equipment even though the slip ring motor could be obtained for nothing.

The importance of this increased efficiency for varying speed, fan drive, or similar drives is further illustrated by Fig. 7, where the operating cost per horsepower per year is plotted against speed. This operating cost includes interest on the capital investment and depreciation at 15 per cent, and a power charge of one cent per kw.h. input. This shows that above 91½ per cent speed the BTS motor is generally more expensive, but for operation at any speed below this it is by far the cheaper equipment. Assume for example a 100-h.p. motor operating continuously at 70 per cent speed. The operating cost per horsepower per year for the slip ring motor is $39.60 and for the BTS motor $33.50. Therefore, with a 100 h.p. motor there would be a saving of $610 per year and at the end of six years the BTS motor would have paid for itself.

For loads requiring constant torque throughout the entire speed range the BTS motor is even more desirable as is shown by the curves of Fig 8 and 9. At 70 per cent speed (Fig 9) the saving is 0.2 kw. per horsepower as compared with 0.092 kw. per horsepower with a fan load (Fig 6). It will be noted that with a slip ring motor driving a constant torque load the input remains constant for all speeds, while the horsepower output decreases directly with the speed.

This type of motor was used for three of the vertical centrifugal pumps in the sewage disposal plant at Albany, N. Y. The pumps have a capacity of pumping from a rated minimum of 5,000,000 gal. to a maximum of 15,000,000 gals. for 24 hrs. against a head of 39 ft. and are driven by 150 h.p., 385 r.p.m., varying speed, brush shifting motors. Mr. John H. Gregory gave a detailed description of the plant and the electrical equipment in Engineering News, June 25, 1916, page 1164 and June 29, 1916, page 1224.

While the brush shifting motor has finer speed control and better efficiency when operated at reduced speeds it does not follow that it is better than the slip ring induction motor for all applications. If only 10% speed reduction is required for a short time during the day then unquestionably the slip ring induction motor will show up better than the brush shifting motor. However, this type of motor for varying speed drives, and the synchronous and super-synchronous types of motors for constant speed drives must be given careful attention in considering power drives for water and sewage pumps as well as other applications.

Should Mechanical Trades be Separate?

Arguments in Favor of the General Contractor Handling all Trades—The Awarding of Segregated Contracts Divides the Responsibility and Interferes with the Proper Function of the General Contractor

Should mechanical trades be handled by a separate contract or incorporated in the general contract? That is a question that often causes discussion among contractors and architects and has advocates of both sides. One of the best arguments that we have seen in favor of the general contract is the following brief issued by the St. Louis Master Builders Association and filed with the Associated General Contractors of America. It has been prepared by the Master Builders' Association in reply to testimony on separate contracts for mechanical equipment submitted to the Interdepartmental Board of Contracts and Adjustments of the United States, April 20, 1923:

It is not a fair statement to cite special cases indicating that separate bids for mechanical equipment represent a material saving over the lump sum of a general contractor's bid, because generally the mechanical sub-contractors having the attitude ot mind stated in the brief, seldom give the general contractor the low sub-bids where sub-bids are also requested direct by the designer or owner, and therefore such prices are not comparable.

They claim an uncertainty arising from double supervision of the general contractor and the designer. Double supervision is not a correct term, as the function of a general contractor is to arrange a proper sequence of work, to secure reduction in cost due to general contractor's knowledge of market trends and conditions, as well as material costs, to prevent delays in completion of the structure and to eliminate friction among the various sub-contractors working on the site. The function of the designer in this connection may be stated to be that of supervising the installation in order to insure proper interpretation of plans and specifications.

General Contractor Knows Trades

The statement that a general contractor may be a stranger as to the mechanical features of the equipment work is seldom true in practice, as the ordinary installations in a building are not so unusual that a general contractor is not thoroughly familiar with the requirements. It might be stated with equal force and perhaps with more specific effect that the staffs of the mechanical sub-contractors themselves being necessarily limited, due to volume of business, seldom contain the mechanical engineers mentioned. In other words, the general contractor, through the greater variety of his experience, is frequently more partial than the practical man in charge for the subcontractor, and has the proper relationship of the subcontract to the whole structure.

That mechanical sub-contracts have been awarded on certain private work is not necessarily a reason for inclusion of such practice in public work. Private work has at least one essential difference from public work in that it need not conform to specific legal requirements or technicalities, that only the individual owner need be satisfied instead of all the public; and that frequently separate sub-contracts are awarded as a matter of convenience in cases where it is desired to start work in advance of full completion of detail plans and specifications, or where the owner desires to select particular sub-contractors for a particular work.

Architect's Fees

The stated approval of this method by leading architects and certain building associations may imply that it is merely the present practice of some architects and may be merely tentative and not applied by any architect to all his work. While not in the least criticizing the practice or questioning the motives of architects, it is expressly stated in Appendix "D," Schedule of Charges of the American Institute of Architects, issued in 1920, "that the architect is to be allowed reimbursement of the costs of the services of heating, ventilating, mechanical and electrical engineers," so that full designing charges are thus properly included in the work of the architect and included in his fee to the owner, so that the owner should not be required to pay for additional engineering costs to be supplied by the mechanical sub-contractors.

In addition, the schedule further states that "the basic rate of the architect's fee applies when all the work is let under one contract. Should the owner determine to have certain portions of the work executed under separate contracts, as the architect's burden of service expense and responsibility is thereby increased the rate in connection with such portions of the work is greater (usually by the per cent.) than the basic rate. In any event, however, the basic rate without increase (6 per cent.) should apply to contracts for any portion of the work on which the owner reimburses the engineers' fees to the architect."

The above quotations from this schedule are cited in order to show the equity of payment by the owner for such services, expense and responsibility occasioned by the inclusion of work of the mechanical sub-contractors, whether such service, expense and responsibility is furnished by the general contractor or the architect.

The argument is made that the mechanical sub-contracts are of peculiar importance in a structure as affecting safety, comfort and convenience, but we see no reason why these features affect in a lesser degree such other features of a building as the proper installation of floors, windows, roofs, etc.

The statement is made that these sub-contractors do not receive fair treatment from the general contractor due to his method of shopping and delayed payments. That such practice is occasionally the fact we no not dispute, but we do not believe that such practice is generally current among the best contractors. And of such occasions when it is true, we wonder whether the general contractors are alone to blame, or whether the sub-contractors have not themselves instituted a practice of under-cutting their quotations if the general contract is awarded to a general contractor. Certainly no sub-contract can be made without the consent of both parties.

Where sub-contractors render the stipulated service we believe that general contractors do allot them the proper share of monthly payments. Such allotment is not only provided for in the standard forms of contracts universally recommended by the American Institute of Architects, but certainly where such practices exist they can be readily corrected by directing the matter to the attention of the architect. We believe it a fair statement to say that if sub-contractors in their anxiety to undertake work reduce their original bid beyond a fair remuneration to themselves, they do it knowingly and frequently because they know that general contractors, through experience and keeping of unit costs, have a very fair knowledge even of sub-contractors' costs and may necessarily upon occasion do the work himself in order to get fair prices for his client, the owner.

General Contractor's Responsibility

One of the main features in connection with awarding a general contract is the statement that time is of the essence of the contract, and a per diem penalty is usually insisted upon by the owner as agreed liquidated damages for non-delivery of the complete structure. Ont of the greatest problems, and therefore services, of the general contractor is to so arrange the sequence of the work of the various crafts involved in the entire structure as to insure its completion on the desired rate.

The awarding of segregated contracts of any kind, without excepting mechanical sub-contracts, divides the responsibility and makes completion of a structure ready for use or occupancy by the owner very unsatisfactory indeed. The plumbing, heating, electrical and sprinkling work in the average building seldom exceeds 15 to 20 per cent of the total construction costs. In addition to the 4 per cent covered in paragraph 5, the contractors may add 1 per cent additional for services of night watchman, provision of storeroom space, cost of fuel and water for additional temporary heat in buildings or to prevent freezing up of pipes, patching of walls and floors behind pipes, removing debris, furnishing adequate fire and contingent liability insurance and overhead.

Assuming a 15 per cent cost item for mechanical installations, the fee of the general contractor of 5 per cent on 15 per cent is three-fourths of 1 per cent of the total cost. If the total building cost is 100 per cent, the taxes, interest, etc., on the building are 10 per cent a year; and if the land cost is 20 per cent, with a 7 per cent tax and interest charge per annum, the carrying charges for the land and building would be 11.4 per cent. for 52 weeks or 0.22 per cent per week, which is equivalent to saying that the contractor's commission of three-fourths of 1 per cent. will be equivalent to 3.4 weeks' carrying charges, if the contractor performed no other service, which of course is not the case.

Conflict Caused by Separate Contracts

The functions of general contractors have been so thoroughly recognized for some centuries that it seems unnecessary to reiterate the point that the division of responsibility for satisfactory completion of a project is unwarranted and uneconomical. That the majority of architects concede that one responsibility is essential is warranted by the fact that even where they receive separate sub-bids on mechanical work, they require their inclusion in the contract of the general contractor, thus practically nullifying the arguments of the sub-contractors against such practice It is natural that employees look to their employers for their remuneration, and sub-contractors who receive remuneration direct from an architect or an owner consequently pay little heed to the requests of the general contractor. Thus practically, though perhaps unconsciously, they are working against their client-owner's best interests when they do not co-operate and occasion frequent weakening of structural members by cutting and patching and additional cost due to the need of extra service, or delays of completion of the entire building. Carried to an extreme and their arguments applied to every sub-contract, there would be continuous conflict and confusion of interest on a building, which cannot fully be co-ordinated by an architect or engineer who has not the practical field experience or financing responsibility at stake.

Finally, it would seem that the very best evidence why the general contractor should handle all work in connection with a structure is the fact that the sub-contracting parties in interest seemingly desire that their responsibilities be as limited as possible and that their own interests would be paramount to the interests of the public. As general contractors who recognize quality of workmanship and service, we are perhaps better fitted than any other branch of the construction industry to recognize the merits and abilities of the mechanical sub-contractors, and we are glad on this occasion, as on many others, to reiterate that recognition and to award them full credit for excellent work well done.

An Added Competition

Frequently the general contractor, in making up his total bid, does not include the quoted figures of the sub-contractor, but on his own responsibility determines a figure, which in his judgment is correct, although later it may not prove so. At any rate the owner has received not only the competition of the sub-contractors but the competiion of the general contractor as well.

In conclusion it should be stated that the mechanical sub-contractors have in many cities made tacit agreements with their craftsmen whom they employ not to work for others than the mechanical sub-contractors, and sometimes only those sub-contractors who belong to a certain group. Such action can al-

(Continued on page 863)

Many Fine Displays at the C. N. E.

A Large Number of Firms Handling Commodities of Interest to the Readers of the Contract Record Are Exhibiting at the Toronto Fair—Brief References to Important Booths

Machinery Hall

Machinery Hall, of course, contains many exhibits of interest to the engineer and contractor. The display of the **John T. Hepburn Company** occupies considerable space in this building. They show many of their well known items, including the portable steel derrick, single purchase hand winch, metal planing lathe, Simplex and Duplex boiler feed pumping outfits, hydrants, etc. A miniature Niagara Falls lends an artistic touch to the display, the water being supplied by one of the company's centrifugal pumping equipments.

At the exhibit of the **Canadian Austin Machinery Company** is shown a complete paving outfit, concrete mixer equipment, farm power and lighting plant, also several interesting photographs of this company's line of contracting machinery in action.

Link-Belt, Ltd. have a display of steel belting in this building. A chain-drive in operation at a speed of 1,000 ft. per minute demonstrates the smooth running qualities of this company's product.

The Rawlplug Company of Canada have an interesting exhibit here. Several samples of materials, such as glass, brick, marble, etc., are shown in which screws have been neatly and securely fastened through the use of Rawlplugs. Interesting literature describing the many practical uses for these products is distributed. Inventions Ltd. are sole agents.

An exhibit of the **A. B. Ormsby Co. Ltd.** in this building consists of an electrically operated steel rolling door in action. Much interest is being displayed in this increasingly popular type of door for industrial plants.

The Canadian Fairbanks-Morse Company's extensive line of machinery and supplies is well represented at their exhibit, oil and gasoline engine equipment being featured. The display also includes many items of contracting machinery and equipment. This company also have an exhibit in the Industrial Building.

The P. L. Robertson Company, of Milton, Ont., are showing their complete range of socket head screws. The line is very complete and includes about every conceivable type and size of screw for various purposes.

Industrial Building

There is much to interest the contractor visitor among the exhibits in the Industrial Building. **The Cooksville Shale Brick Company,** of Cooksville, Ont., have a very attractive exhibit in this building. Two walls of the booth are built up with Cooksville brick in varied colors, presenting a very neat and practical display.

The Laidlaw Lumber Company, of Toronto, have a large exhibit and show a very complete line of doors, trim, flooring, etc. The exhibit includes a small one-room house, completely trimmed with products of the company, which is open to public inspection.

Another firm showing products in this line is the **Buyers' Door & Manufacturing Co.,** of West Toronto. This exhibit also occupies a large space and every inch of it is required to accommodate this company's large line of doors, interior trim, etc.

The Pannill Door Company, of Toronto, have an excellent display of unfinished doors in a wide selection of designs at their exhibit in this building.

The exhibit of the **Consolidated Plate Glass Company** here has a full size "Zouri" metal store front, as built by this firm. Other of the company's products in glass are on display inside the booth.

Crane Limited's exhibit is one of the largest, if not the largest, in this building. They feature bathroom, kitchen and toilet fixtures in porcelain, but the display also includes several lines of valves and water works fittings manufactured by this company. A model bathroom, fully equipped, is one of the features of their exhibit.

The extensive line of articles in brass, as manufactured by the **James Morrison Brass Manufacturing Company,** of Toronto, are shown at this company's large exhibit. Their line of valves and water works fittings is featured and presents a very complete display of this type of equipment.

Miscellaneous Buildings

The Argus Manufacturing Company's exhibit is located in Manufacturers' Bldg., No. 2, underneath the grand stand. Miniature house models show the application of this company's product Roofcoat, a waterproofing and weatherproofing material. They also have a window section on display, equipped with their plastic weather strip.

The exhibit of the **Ontario Association of Architects** is located in the Government Building. It includes a number of handsome color sketches and models in plaster and clay of several of Canada's fine public buildings, churches, schools, residences, memorial monuments, etc. The feature of the exhibit is a large plaster model of the war memorial cenotaph being erected by the Canadian Government at Vimy Ridge.

Heavy duty trucks for contractors' use were included in the displays of the following manufacturers at the exhibit of motor trucks and accessories in the west annex of the Coliseum: Federal Motor Truck Co. Ltd., Toronto; British & American Motors, Ltd., Toronto; Brooks Steam Motors Ltd., Toronto; Gotfredson Truck Corporation, Toronto; Harmer Knowles Motor Truck Co. Ltd., Toronto; Leyland Motors, Ltd., Toronto; Mack Trucks of Canada, Toronto; The Pierce Arrow Motor Car Co., Toronto; Republic Truck Co. of Canada, Toronto; Ruggles Motor Truck Company, London; Sterling Motor Truck Company, Toronto, and The White Co. Ltd., Toronto.

Grounds

The exhibit of the **Clay Products Agency** occupies a tent on the grounds and includes an extensive line of sewer pipe, fire brick, and other articles of clay. A half section of 48-in. segment block sewer is on display outside the tent.

In the tent occupied by the **Granite Concrete**

Block Co., of Weston, Ont., many interesting photographs are on display, showing the company's product in buildings and residences erected in Canada. The block itself is shown in a small section of wall erected outside the tent.

The Ontario Gypsum Company are again located in their handsome little two-room bungalow just off the main thoroughfare, opposite the grandstand. The interior walls and ceilings are of various constructions, depicting the many different finishes that may be obtained with Gypsum products, including tiled effects for kitchen and bathrooms, block patterns and sections with wall paper applied directly to the interior board. Two short wall sections are built outside the bungalow, demonstrating the method of constructing walls. One of these sections is faced with tapestry brick. Demonstrations of the fire resistive quality of Gypsum materials are given and a large quantity of literature describing the various products is distributed.

The exhibit of the **Toronto Builders Supplies, Ltd.**, is located immediately next to the Ontario Gypsum Company's bungalow. They have a handsome miniature residence, complete in exterior detail, the walls of which have a base and finish coat of the company's product "Cemo" stucco mortars. They are distributing a well illustrated and instructive booklet on "Cemo" products. This company is Canadian agent for Best Bros.' Keene's cement.

The Toronto Asphalt Roofing Company have their exhibit this year in their own bungalow, a neat little one room building roofed with asphalt shingles in green and reddish brown shades. The exhibit is a very attractive one, the abundance of vari-colored shingles on display lending plenty of color to it. A model roof in miniature displays the neat and artistic effects that may be obtained with these shingles.

The Bishopric Manufacturing Company, Brantford Roofing Company and **Bird & Son** are again located in their permanent bungalows, which are equipped respectively with the lines of these companies in wall construction, roofing materials, etc. These exhibits are well known to regular visitors to the Fair and are visited and admired by large crowds every day.

The extensive line of contractors' machinery manufactured by the **Wettlaufer Machinery Company** is displayed at a large tent on the grounds. Working demonstrations of the machines are given and concrete blocks are manufactured in one of their block machines. This is one of the most interesting exhibits for the contractor on the grounds.

The Metal Shingle & Siding Company, of Preston, also have their exhibit on the grounds, adjacent to the eastern entrance. Among the products shown are metal roofing, tanks, steel sash, metal lath, etc. A portable metal garage manufactured by this company forms the background of the display. They also show an interesting model, in miniature, of a steel barn.

Another exhibitor in this line is the **Metallic Roofing Company**, of Toronto. Their exhibit covers considerable space and includes several lines of metal construction, such as ventilators, eavetroughs, tanks, corrugated iron siding, metal roofing, etc. Two types of portable metal garages are shown.

The Imperial Oil Company is one of the best represented exhibitors at the fair. This company has booths in several of the buildings in addition to their own building, where a majority of their very extensive line of products is on display. The road contractor will be interested in their paving materials, road oils, etc.

Letters to the Editor

Combat Unfair Practices

Montreal, P.Q.

Editor, Contract Record:

I have noticed in the Contract Record of August 22nd, the letter by a contractor about the unfair method adopted by the town of Thorold in letting contracts for some municipal work.

I do not believe that there is any better way the contracting fraternity could combat this unfair practice, which occurs occasionally, than to give it sufficient publicity such as you are doing, so that when the same town is calling for tenders again the substantial contractors would refuse to figure. By this means the town would lose the benefit of competitive bidding altogether, and would be effectively brought to time. I have seen such practice cured several times by this method.

It is hardly necessary for me to say that if the facts as stated are true, and if the lowest bidder was a responsible contractor, the work should have been awarded to him in all fairness.

Yours very truly,
J. P. Anglin,
President, Anglin-Norcross Ltd.

Suggests Preferential Treatment

Niagara Falls, Ont.

Editor, Contract Record:

I have noticed in your August 22 issue your article headed "Political Juggling of Municipal Tenders."

I suppose this trouble is as old as the contracting business. Probably when more cuniform tablets are deciphered in the valley of the Euphrates, we will learn that the Babylonians had regulations regarding it but could not enforce them. I agree with the tenor of your article, but think you overstate the case when you say the cost of all bids is included in the average cost of work. This does not allow for the fact that there is an annual crop of pikers. These pikers do not know how to bid, and lose money either of their own or their backers.

Standard practice by private owners, as well as public corporations is to advertise that the lowest or any bid will not necessarily be accepted. I really think there are more mistakes made by taking the lowest tender than otherwise, but most public officials are so afraid of being accused of bias in favor of a bidder that the lower tender is accepted against the better judgment of the engineers.

Regarding the home tender, of which Toronto has always been an outstanding advocate, it might be fair to openly advertise that the home bidders would have a certain percentage preference—say one per cent. or any per cent. they thought wise.

Yours truly,
T. S. Scott,
City Manager and Engineer.

What Truck Equipment Should be Used for Road Building?

Economic Study of Investment and Operating Costs on a Ton-Mile Basis—Comparative Performance

In determining the economical truck equipment to employ in hauling road materials the following conditions have to be regarded:

General Conditions:

1. Distance materials are to be hauled.
2. Will the road support the wear and tear of heavy traffic?
3. Time lapse before getting onto subgrade after a rain.
4. Investment allowed in estimate for hauling equipment.

Investment:

1. Comparative original costs.
2. Comparative depreciation.
3. Comparative investment in proportion to load-per-day carried.

Operation and Maintenance:

1. (a) Ease of securing drivers. (b) Rate of pay.
2. (a) Ease of securing experienced mechanics. (b) Rate of pay.
3. (a) Ease of securing mechanical parts and comparative costs. (b) Will stocking of parts be necessary? (c) Likelihood of delay in waiting for parts.
4. Cost of tires.
5. Life of tires.
6. Comparative consumption of gasoline and oil.
7. Comparative cost of maintenance of road for various type of trucks.

To what extent does each affect the cost of transportation? In order to avoid generalities and arrive at some definite conclusions, let us assume the following:

1. Grades not to exceed 4 per cent. and road conditions similar to those found in the states of Indiana, Illinois, Iowa and Michigan.
2. Material hauled in proportioned batches to the mixer and not dumped on the sub-grade.
3. The use of a turntable to turn trucks at the mixer.
4. Gasoline at 25c. a gallon.
5. Lubricating oil at 60c. a gallon.
6. A 10-hour working day.
7. 150 working days per year.
8. 800 sq. yd. of pavement 7 1/2 in. thick laid per day.

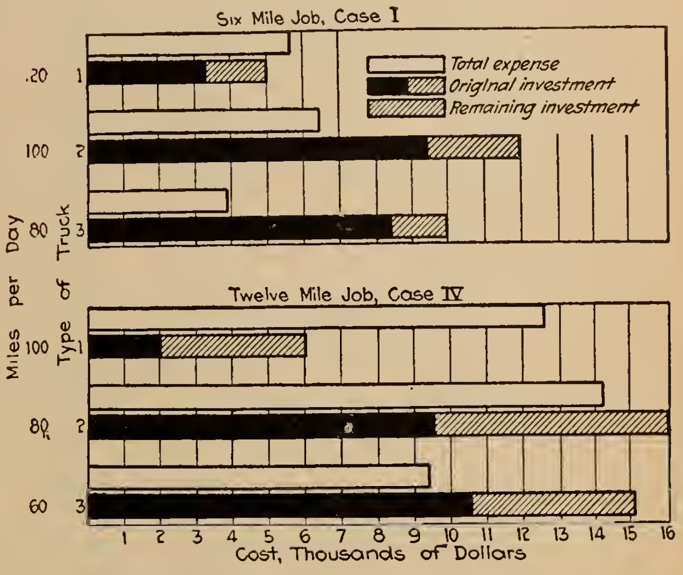


Fig. 2—Investment costs in three sizes of trucks

With these assumptions in the background, let us

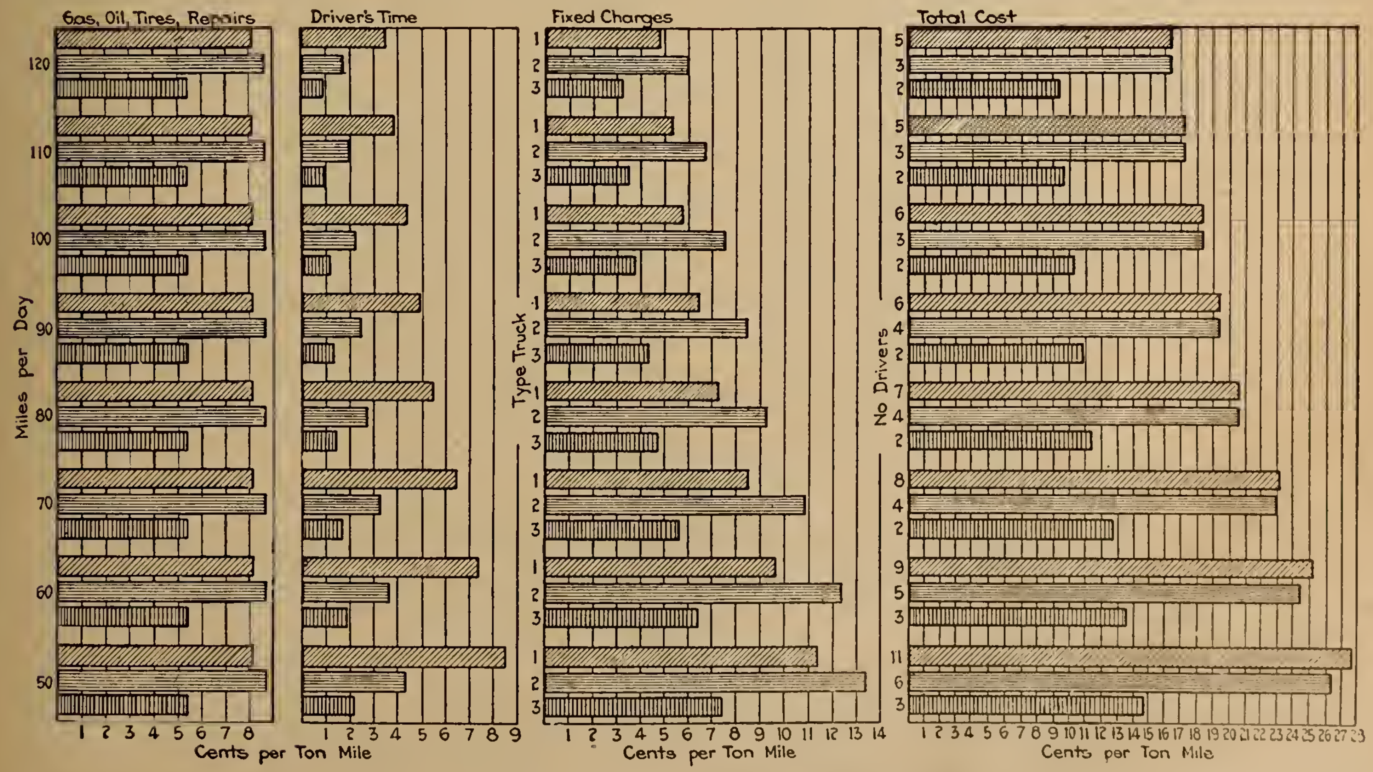


FIG 1—TON-MILE COSTS FOR THREE SIZES OF TRUCKS

—Illustrations by courtesy of Engineering News-Record

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*Condensed from a paper read at the annual convention of the American Road Builders Association by A. E. Horst, Henry W. Horst Co., Rock Island, Ill.

TABLE—COMPARATIVE TRUCK COSTS AND PERFORMANCE BASED ON WEIGHTS AND SPEEDS

Miles a day		50			60			70			80	
1. Working days a year		150			150			150			150	
2 Miles per year		7,500			9,000			10,500			12,000	
3. Average mile haul		1.5			1.5			1.5			1.5	
4. Trips per day		17			20			23			27	
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5. Tons hauled each trip	1.6	3.2	6.4	1.6	3.2	6.4	1.6	3.2	6.4	1.6	3.2	6.4
6. Ton miles per day	41	82	164	48	96	192	55	110	220	65	129	260
7. Investment per unit	1,000	4,000	5,000	1,000	4,000	5,000	1,000	4,000	5,000	1,000	4,000	5,000
8 Charge off per year	700	1,793	1,844	700	1,793	1,844	700	1,793	1,844	700	1,793	1,844
9. T. M. hauled each year	6,160	12,300	24,600	7,200	14,400	28,800	8,250	16,500	3,300	9,750	19,400	39,000
10. Fixed cost per T.M.	11.4	13.5	7.4	9.7	12.4	6.4	8.5	10.9	5.6	7.2	9.2	4.7
11. Driver cost per 150 days	525	525	525	525	525	525	525	525	525	525	525	525
12. Driver cost per T.M.	8.5	4.3	2.1	7.3	3.6	1.8	6.4	3.2	1.6	5.4	2.7	1.3
12a. Driver plus fixed cost per T.M.	19.9	17.8	9.5	17.0	16.0	8.2	14.9	14.1	7.2	12.6	11.9	6.0
13. Gas, oil, tires, repairs per mile	6.5	14.0	17.2	6.5	14.0	17.2	6.5	14.0	17.2	6.5	14.0	17.2
14. Gas, oil, tires, repairs T.M.	7.9	8.5	5.2	8.1	8.4	5.4	8.3	8.9	5.5	8.0	8.7	5.3
14a. Driver, plus gas, etc. T. M	6.4	12.8	7.3	15.4	12.0	7.2	14.7	12.1	7.1	13.4	11.4	6.6
15. Total cost T. M.	27.8	26.3	14.7	25.1	24.4	13.6	23.3	23.0	12.7	20.6	20.6	11.3
16. Theoretical trucks needed 435 T.M. per day	10.6	5.3	2.7	9.0	4.5	2.3	7.9	3.9	1.9	6.7	3.4	1.7
17. Actual trucks needed	11	6	3	9	5	3	8	4	2	7	4	2
18. Investment in fleet	11,000	24,000	15,000	9,000	20,000	15,000	8,000	16,000	10,000	7,000	16,000	10,000
Six Miles Work												
19. Fixed cost	3,900	4,700	2,600	3,300	4,300	2,200	2,900	3,800	1,900	2,500	3,200	1,600
20. Gas, oil, etc.	5,700	4,400	2,500	5,300	4,100	2,500	5,100	4,200	2,400	4,600	3,900	2,300
21. Total cost	9,600	9,100	5,100	8,800	8,400	4,700	8,000	8,000	4,300	7,100	7,100	3,900
22. Remaining investment	7,100	19,300	12,400	5,700	15,700	12,800	5,100	12,200	8,100	4,500	12,800	8,400
Twelve Miles Work												
23 Fixed cost	7,800	9,400	5,200	6,600	8,600	4,400	5,800	7,600	3,800	5,000	6,400	3,200
24 Gas, oil, etc	11,400	8,800	5,000	10,600	8,200	5,000	10,200	8,400	4,800	9,200	7,800	4,600
25 Total cost	19,200	18,200	10,200	17,200	16,800	9,400	16,000	16,000	8,600	14,200	16,200	7,800
26 Remaining investment	3,200	14,600	9,800	2,300	11,400	10,600	2,200	8,400	6,200	2,000	9,600	6,800

Miles a day		90			100			110			120	
1. Working days a year		150			150			150			150	
2 Miles per year		13,500			15,000			16,500			18,000	
3. Average mile haul		1.5			1.5			1.5			1.5	
4. Trips per day		30			33			37			40	
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5. Tons hauled each trip	1.6	3.2	6.4	1.6	3.2	6.4	1.6	3.2	6.4	1.6	3.2	6.4
6. Ton miles per day	72	144	288	80	160	320	89	178	356	96	192	384
7. Investment per unit	1,000	4,000	5,000	1,000	4,000	5,000	1,000	4,000	5,000	1,000	4,000	5,000
8 Charge off per year	700	1,793	1,844	700	1,793	1,844	700	1,793	1,844	700	1,793	1,844
9. T. M. hauled each year	10,800	21,600	43,200	12,000	24,000	48,000	13,300	26,800	53,400	14,400	28,900	57,000
10. Fixed cost per T.M.	6.5	8.3	4.3	5.8	7.5	3.8	5.3	6.7	3.5	4.9	6.0	3.2
11. Driver cost per 150 days	525	525	525	525	525	525	525	525	525	525	525	525
12. Driver cost per T.M.	4.9	2.4	1.2	4.4	2.2	1.1	3.9	2.0	1.0	3.6	1.8	.9
12a. Driver plus fixed cost per T.M.	11.4	10.7	5.5	10.2	9.7	4.9	9.2	8.7	4.5	8.5	7.8	4.1
13. Gas, oil, tires, repairs per mile	6.5	14.0	17.2	6.5	14.0	17.2	6.5	14.0	17.2	6.5	14.0	17.2
14. Gas, oil, tires, repairs T.M.	8.1	8.7	5.4	8.1	8.7	5.4	8.1	8.6	5.4	8.1	8.8	5.4
14a. Driver, plus gas, etc. T. M	13.0	11.1	6.6	12.5	10.9	6.5	12.0	10.6	6.4	11.7	10.6	6.3
15. Total cost T. M.	19.5	19.4	10.9	18.3	18.4	10.3	17.3	17.3	9.9	16.6	16.6	9.5
16. Theoretical trucks needed 435 T.M. per day	6.0	3.1	1.5	5.5	2.7	1.3	4.9	2.4	1.2	4.5	2.3	1.1
17. Actual trucks needed	6	4	2	6	3	2	5	3	2	5	3	2
18. Investment in fleet	6,000	16,000	10,000	6,000	12,000	10,000	5,000	12,000	10,000	5,000	12,000	10,000
Six Miles Work												
19. Fixed cost	2,200	2,900	1,500	2,000	2,600	1,300	1,800	2,300	1,200	1,700	2,100	1,100
20. Gas, oil, etc.	4,500	3,800	2,300	4,300	3,800	2,300	4,100	3,700	2,200	4,000	3,700	2,200
21. Total cost	6,700	6,700	3,800	6,300	6,400	3,600	5,900	6,000	3,400	5,700	5,800	3,300
22. Remaining investment	3,800	13,100	8,500	4,000	9,400	8,700	3,200	9,700	8,800	3,300	9,900	8,900
Twelve Miles Work												
23 Fixed cost	4,400	5,800	3,000	4,000	5,200	2,600	3,600	4,600	2,400	3,400	4,200	2,200
24 Gas, oil, etc	9,000	7,600	4,600	8,600	7,600	4,600	8,200	7,400	4,400	8,000	7,400	4,400
25 Total cost	13,400	13,400	7,600	12,600	12,800	7,200	11,800	12,000	6,800	11,400	11,600	6,600
26 Remaining investment	1,200	10,200	7,000	2,000	7,800	7,400	1,400	7,400	7,600	1,600	8,800	7,800

classify trucks of 2-ton capacity and less as light trucks. Let us depreciate them over 2 years of 150 working days each, thus making the average expenditure on a truck one-half of its original cost (one-half of $1,000) plus yearly expense of say $200 or a total of $700. This class of trucks is designated as Type 1.

Similarly, for sake of comparison, let us classify trucks of 2-ton to 3 1/2-ton capacity as medium trucks, depreciated over 3 years with average yearly expenditure of $1,793. These will be designated as Type 2, while all trucks of over 3 1/2-ton capacity will be classified as heavy trucks, depreciated over 4 years with average yearly expenditure of $1,844. These trucks will be designated as Type 3.

The table gives a cost, performance and investment comparison of the three types of trucks at speeds from 50 to 120 miles per day. Fig. 1 shows graphically the ton-mile costs given in the table for each truck for each speed. Using the same figures, Fig. 2 shows the comparative total operating cost, original investment and remaining investment on the three types of truck, first, on the completion of a 6-mile job operating 120, 100 and 60 miles a day and, second, on the completion of a 12-mile operating 100, 80 and 60 miles a day.

In view of these tabulations and charts and the apparent economy of Type 3 consider the following:

1. Can we afford to have but 3 trucks for handling 12 miles of work? Suppose one truck breaks down, we operate but 66 2/3 per cent. efficient whereas with one of six light trucks out of commission we operate 84 per cent. efficient.

2. Can we afford to take chances with heavy loads on highways which are being paved because they cannot take care of the present ordinary traffic?

3. Can we afford to put one additional man every one-half mile on our sub-grade over and above those required to keep the grade in shape for light trucks? (This additional expense alone amounts to over $1,600 on a 12-mile job).

4. Compare a jerky operation with 3 trucks of 4 batches each with the more continuous operation of 6 light one-batch units.

5. Compare the investment of $15,000 in a fleet of 3 large trucks for 12 miles of work after which we still have $10,600 tied up in 3 units, with an investment of $6,000 in 6 lighter trucks and, after 12 miles of work, but $2,000 tied up in 6 units.

Each type of truck has its place in the transportation problems of the highway contractor. It is only possible, however, to secure the best and most economical equipment for each job through an intelligent analysis of all factors involved in the operation of the truck. In other words, let us make an accurate analysis of the ton-mile cost.

Gypsum Production in Canada

Reporting upon gypsum production in Canada for 1922, the Dominion Bureau of Statistics shows that shipments of all grades reached a total of 559,265 tons, valued at $2,160,898, an increase of 172,715 tons, and $375,360 over the figures for 1921. The quantity quarried, by provinces, was: Nova Scotia, 281,861 tons; New Brunswick, 56,692 tons; Ontario, 106,829 tons; Manitoba, 39,147 tons and British Columbia, 100 tons.

For the Building Supply Dealer

Helping the Dealer to Put "Gyproc" Across

Supply Dealers are Enabled to Build up a Healthy Business Through the Helpful Co-operation of the Manufacturer

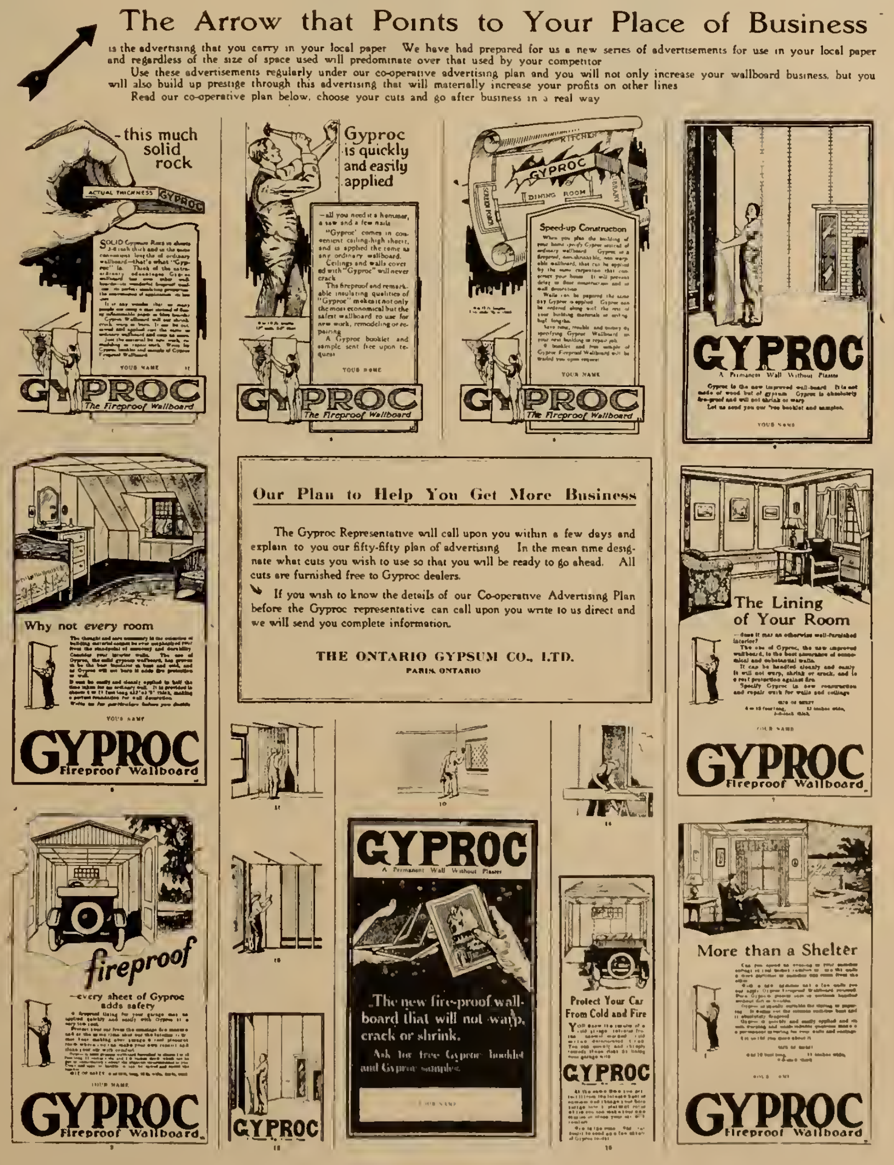
If the building supply dealer cannot sell gypsum products it is no fault of the Ontario Gypsum Co. Everything that it is possible for any manufacturer to do to assist dealers in marketing building supplies is being done by this firm, whose factory in Paris, Ont., produces a wide line of gypsum commodities. Recently their efforts have been intensified and dealers are now receiving a brand of co-operation that is as practical as it is exceptional. All that is needed to completely round out the plan that the Company have in mind is the whole-hearted support and enthusiasm of the dealers and their willingness to co-operate with the manufacturer and cash in on the business which has been brought within their reach.

The basis of the Ontario Gypsum Co.'s campaign is advertising, because they recognize that advertising, properly conducted, is unexcelled as a business-getting medium. What they have taken cognizance of, however, is the fact that building supply dealers, especially those in the smaller communities, know very little about advertising. If they have ever done any, as likely as not it has not been conducted with any proper knowledge of how advertising should be handled. Of course, in some of the larger towns, dealers are in the habit of using space fairly regularly in the local newspapers but even much of this advertising would bear improvement and could be made much more effective.

In view of this fact, the Ontario Gypsum Co. have worked out a co-operative advertising plan which serves the dual purpose, (1) of inducing the dealer to advertise and helping him to advertise properly and (2) of selling the public on the use of gypsum. The advertising which has been prepared centers, for the present, around "gyproc," a fireproof wallboard that is wonderfully effective for building purposes.

A series of gyproc advertisements for use in local newspapers has been developed. These are quite striking and are bound to catch the attention of the reader. A few samples of the advertisements are shown in the accompanying cut which is reduced from a large sheet 18" x 25" which is distributed by the Ontario Gypsum Co. to dealers.

Any of the cuts shown on this sheet, as well as a number of others which are not illustrated, are available free of charge to dealers for advertising purposes. Furthermore, the Ontario Gypsum Co. absorb half of the cost of the advertising. In other words, the dealer who reaps the benefit from the advertising only has to pay half the cost. This fifty-fifty arrangement may work out in a number of different ways. The dealer himself, for example, may arrange with the local paper publisher for the space and remit half the cost to the Ontario Gypsum Co. Another way, which is widely used, is for the agency handling the Ontario Gypsum Company's advertising to plan a campaign with the newspapers for the space. As a rule the agency can get a better rate than the


The Arrow that Points to Your Place of Business

is the advertising that you carry in your local paper. We have had prepared for us a new series of advertisements for use in your local paper and regardless of the size of space used will predominate over that used by your competitor.

Use these advertisements regularly under our co-operative advertising plan and you will not only increase your wallboard business, but you will also build up prestige through this advertising that will materially increase your profits on other lines.

Read our co-operative plan below, choose your cuts and go after business in a real way.

Our Plan to Help You Get More Business

The Gyproc Representative will call upon you within a few days and explain to you our fifty-fifty plan of advertising. In the mean time designate what cuts you wish to use so that you will be ready to go ahead. All cuts are furnished free to Gyproc dealers.

If you wish to know the details of our Co-operative Advertising Plan before the Gyproc representative can call upon you write to us direct and we will send you complete information.

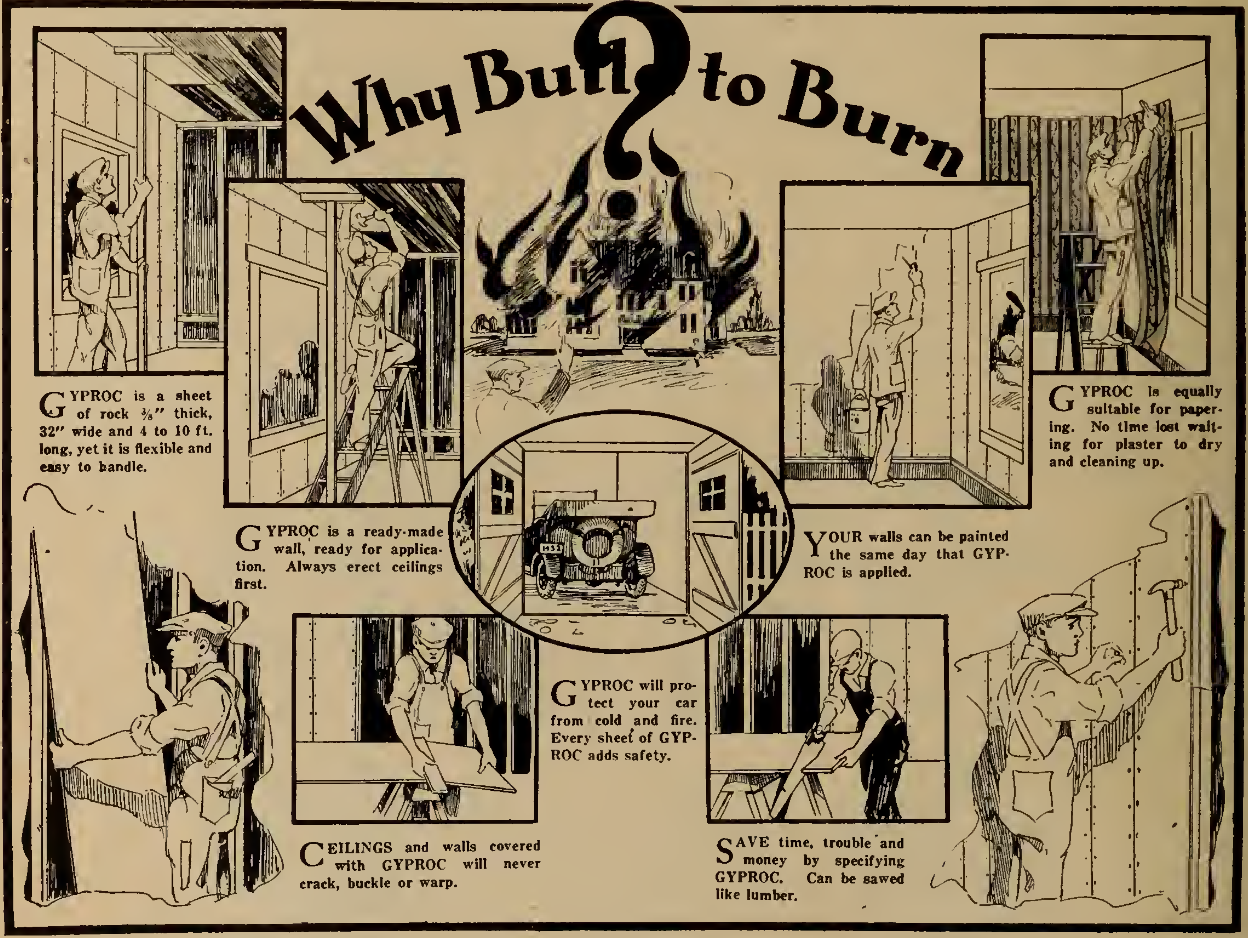
THE ONTARIO GYPSUM CO., LTD.
PARIS, ONTARIO

-this much solid rock
ACTUAL THICKNESS GYPROC
Gyproc is quickly and easily applied
GYPROC The Fireproof Wallboard
KITCHEN
DINING ROOM
Speed-up Construction
GYPROC A Permanent Wall Without Plaster
Why not every room
GYPROC Fireproof Wallboard
The Lining of Your Room
fireproof
—every sheet of Gyproc adds safety
The new fire-proof wallboard that will not warp, crack or shrink.
Ask for free Gyproc booklet and Gyproc samples.
Protect Your Car From Cold and Fire
More than a Shelter

A reproduction in miniature of a collection of advertisements which the Ontario Gypsum Co., make available to building supply dealers dealer and in addition the agency can take the responsibility for changing copy regularly. In this case the Ontario Gypsum Co. charge up the dealer with half the cost of the advertising, which may, if the dealer desires, be paid in easy instalments. In this way, a small dealer who does not sell much material would not feel the expense of advertising bearing very heavily upon him.

It will thus be evident that dealers in gyproc wallboard are not by any means left to their own resources when it comes to selling the material. The co-operative advertising scheme, when the dealers advertise regularly, has been found to very materially increase the dealers' wallboard business. Also, by building up prestige for the dealer it very substantially increases his profits on other lines.

Not only does the dealer get every possible assistance in advertising, but he gets direct co-operation in obtaining business, for the travellers of the Ontario Gypsum Co. are constantly calling on the contractors and builders and explaining the merits of gyproc. The dealer in the locality, of course, gets the business when the contractor is ready to buy, except when the purchaser wants a car lot, in which case he may order directly from the factory. However, in such a case the dealer is protected by the company and the difference between the protection price and factory price is remitted to the dealer. As the factory will not sell direct in less than car lots the contractor must place his small orders with the dealers, and as in the majority of cases requirements are for small lots, the dealer getting practically all the business that develops in his territory.



GYPROC is a sheet of rock ⅜" thick, 32" wide and 4 to 10 ft. long, yet it is flexible and easy to handle.

GYPROC is a ready-made wall, ready for application. Always erect ceilings first.

GYPROC is equally suitable for papering. No time lost waiting for plaster to dry and cleaning up.

YOUR walls can be painted the same day that GYPROC is applied.

GYPROC will protect your car from cold and fire. Every sheet of GYPROC adds safety.

CEILINGS and walls covered with GYPROC will never crack, buckle or warp.

SAVE time, trouble and money by specifying GYPROC. Can be sawed like lumber.

Another publicity folder prepared by the Ontario Gypsum Co., which may be used by the dealer for direct-by-mail circularizing

With the Dealer in the West

Two Representative Building Supply Men Report on Conditions in Winnipeg and Saskatoon

In the West prices of building supplies have been very firm, in spite of a somewhat curtailed demand. Building has been somewhat inactive and consequently the supply dealers have had to be satisfied with a smaller volume of business than their facilities were capable of handling. There is not much complaint, however, and the general feeling is that the supply business, although not rushing, has been satisfactory. From all reports there is no dearth of materials. Two typical reports covering the situation in the West follow:

Low Margin of Profit

Winnipeg, Man.
Aug. 21, 1923.

Editor, Contract Record:

Building activity in Winnipeg is very quiet. There are very few buildings of any size being erected, and the most of the building that is being done are houses and small stores.

The demand for building material is small and the supply yards can take care of a far greater amount of business and not be rushed.

Prices have been holding fairly firm all season in spite of the lack of building, but, of course, all prices are set at a low margin of profit, and on account of the demand being limited there is no likelihood of a change in price.

Very truly yours,
Braid & McCurdy,
Per A. G. McCurdy

Fairly Active Trade Conditions

Saskatoon, Sask.
Aug. 20, 1923.

Editor, Contract Record:

Building construction has been comparatively inactive in and around Saskatoon this season. There are many more contractors anxious to secure jobs than there are jobs available. Nevertheless there is a certain amount of construction work going on.

Under way at the moment there are two University buildings, both small; additions to the power house at the university and an addition to the armory. The footings are being put in for a small public school in Nutana, the voting on which is expected to be favorable but as yet it has not been taken. A comparatively small amount of sidewalk construction is under way and some sewer work.

In prospect we have a Provincial Sanatorium, a job the estimated cost of which will be $300,000.00. No definite information is available as to when tenders will be asked for.

House construction is being carried on to a certain extent, the houses being built this year are of a considerably higher order than those constructed in the last year or so, the majority of the houses this year being built for owners rather than for sale by the contractor after completion.

County and town schools in the district surrounding Saskatoon are the cause of practically the only construction work apart from road work, being carried on in rural districts.

Notwithstanding the fact that work is quite limited in extent, builders' supplies have been fairly active in every month with the exception of July, although volume has been necessarily curtailed.

Prices remain quite constant in all lines with perhaps the exception of clay products. There has been a noticeable reduction in the price of common brick and some reduction on face brick. The supply of all material is more than adequate.

Yours very truly,
Building Products and Fuel Ltd.
Per L. A. Smith.

Should Mechanical Trades be Separate?

(Continued from page 856)

most be constructed as restraint of trade, which may be further illustrated by the fact that where general contractors have made sincere efforts to adjust wages of the building crafts in accordance with fluctuating cost of living, these mechanical trades have not co-operated in such movements. An attitude therefore of such a group starting with its labor, frequently attempting to control supply of material solely to themselves, now seeks further restriction by trying to close the sources receiving their bids. As general contractors we cannot commend such a spirit or agree upon the merit of such tendencies.

British Exhibits at C. N. E.

The Federation of British Industries, which organized the "Made in Great Britain" display shown at the Canadian National Exhibition this year, represents 1900 British manufacturing establishments with a capitalization of twenty five billion dollars. It ramifies to all parts of the world and has representatives in 46 different countries.

The Week's Developments in a Nutshell

Like a thunderstorm on a sultry July day, the amalgamation of the Bank of Hamilton with the Bank of Commerce has cleared the financial atmosphere and inspired the whole country with confidence in the stability of industry. The important points that have been emphasized in this connection by prominent bankers are: first, that the really crucial period is some months behind us and that any weak places that may be showing up at the moment are not due to present developments; second, that the standing of the Bank of Hamilton is unimpaired and is being taken over on a share for share basis, which is particularly reassuring in view of the recent depreciation of this stock, and, third, the statement of Sir Frederick Williams-Taylor, the general manager of the Bank of Montreal and chairman of the Canadian Bankers Association, that no further mergers are anticipated and that there are no other clouds on the bank horizon.

The Canadian National Exhibition at Toronto is the other big event at the moment. It is a most reassuring sign that the attendance and interest in this exhibition continues to increase rapidly. The splendid exhibits of Canadian-made products—electrical goods, furniture, boots and shoes etc.—are educating the general public to understand that imported lines are no longer necessary. This year there is also more actual business being done and the exhibitors in the main are really optimistic regarding the immediate future.

Building prices remain firm. Permits are naturally lagging as the season advances. Steel companies report that orders coming in are not quite equal to present output. On the other hand, there is steady demand for labor and no unemployment. Lumber mills report a shortage of labor for logging operations.

How Should Theatres and Halls be Built?

The Portland Cement Association Have Developed a Set of Regulations That are Recommended as a Model for Widespread Adoption with Such Modifications as Suit Individual Requirements

This article dealing with an ideal building code continues the series started in the Contract Record of three weeks ago. This instalment deals with theatres and assembly halls, indicating the regulations that should govern their design and construction. Those parts of the code which apply to this class of buildings are as follows:

Section 58. Classification

Theatres. This classification includes all buildings or parts of buildings used for theatrical, operatic, or motion picture performances of a public nature, except as provided in this section.

Assembly Halls. This classification includes all buildings or parts of buildings not included under "theatres," where 100 or more persons assemble for entertainment, instruction, worship or dining purposes.

A private assembly hall is one built in connection with a school, club, church, or society building, and used only for private gatherings, and not rented for public use. Every other assembly hall is a public assembly hall.

Occasional private motion picture performances (not more than two in any week) may be given in a private assembly hall, but in all such cases a fireproof booth must be provided according to Section 75.

Occasional private theatrical or operatic performances (not more than two in any week) may be given in a private assembly hall; but in all such cases the stage must be protected as in Sections 67, 68 and 73.

Occasional motion picture or theatrical performances (not over two in any week) may be given in a public assembly hall which is located on the first floor and accommodates not over 300 persons. In all such cases a fireproof booth must be provided and the stage must be protected as in Sections 67, 68, 73 and 75. No place of assemblage shall be located over any such assembly hall.

Section 59. Height and Class of Construction

Theatres. The main entrance or entrances shall not be at a higher level than 3 steps of 6 inches each, above the sidewalk at that point. The floor level at the highest row of seats, on the main floor, shall not be more than 6 feet above the sidewalk level at the main entrance; and the floor level at the lowest row of seats, on said floor, shall not be more than 6 feet below the level of the adjoining sidewalk.

Theatres which accommodate not more than 500 persons shall be of ordinary construction or better.

Theatres which accommodate more than 500 persons shall be of fireproof construction; except the stage floor, which shall be of fireproof or mill construction (steel beams need not be fireproofed); and except the roof, which may be of wood but must have an incombustible roof covering. If the theatre accommodates more than 1,000 persons, the roof shall be incombustible throughout.

Balconies and galleries shall be of fireproofed construction. No balconies or galleries will be permitted in theatres which accommodate 500 persons or less unless the buildings are built as specified above for theatres accommodating more than 500 persons.

Assembly Halls. Assembly halls which accommodate more than 1,000 persons shall be of fireproof construction. Balconies and galleries shall be of fireproof construction. Assembly halls which accommodate not more than 1,000 persons shall be of ordinary construction or better, except as follows:

Assembly halls accommodating not more than 750 persons may be built of frame construction provided the following conditions are complied with:

(1) The entire building shall not be more than one story high nor more than 6,000 square feet in area.

(2) The foundation walls and piers shall be of incombustible construction.

(3) The building shall be at least 10 feet away from any other building or adjoining lot line.

(4) The balcony shall not accommodate more than 100 persons and the balcony stairway shall lead directly to an outside door.

Every assembly hall accommodating more than 750 persons shall have the highest point of the main auditorium floor not more than 8 feet above, and in no case below, the grade line at the main entrance; except that in a building of fireproof construction, the highest point of such auditorium floor shall be not more than 15 feet above such grade.

An assembly hall accommodating not more than 750 persons and with not more than one balcony, may be placed in the second story of a building of fireproof construction provided the highest point of the main auditorium floor is not more than 22 feet above the grade at the main entrance of the building.

An assembly hall accommodating not more than 400 persons and with not more than one balcony, may be placed in the third story of a building of fireproof construction, provided the highest point of the main auditorium floor is not more than 35 feet above the grade at the main entrance to the building.

In a building which accommodates not more than 1,000 persons the ceiling and the roof may be of combustible material, but the roof covering must be incombustible.

An assembly hall accomodating not more than 400 persons and having no balcony or gallery may be placed on the second floor of a building of ordinary or mill construction, provided the highest point of the floor is not more than 22 feet above the grade at the main entrance of the building.

An assembly hall accommodating not more than 200 persons and having no balcony or gallery may be placed in the third story of a building of ordinary or mill construction, provided the floor level is not more than 35 feet above the grade at the main entrance of the building; or may be placed in any story of a building of fireproof construction.

In the case of a private assembly hall, each of the above numbers of persons may be increased 25 per cent.

Section 60. Exposure and Courts

The wall containing the main entrance to any theatre or public assembly hall shall abut on a street. The lobby or passageway leading from the main entrance to the main auditorium door shall be not longer than 50 feet nor longer than three times its width, unless it is enclosed with unpierced fireproof ceiling and floor and with an unpierced standard fire wall on each side, but if the theatre or assembly hall accommodates not more than 500 persons, such passageway shall be enclosed with unpierced fireproof or semi-fireproof ceiling, floor and partitions.

Every theatre or public assembly hall which accommodates more than 300 persons shall have at least three walls abutting on streets, alleys, or open courts, except as follows:

(1) If the building is not more than 100 feet long, and each aisle leads directly to an exit at the rear, then no side court will be required.

(2) If the building is not more than 40 feet wide, and there is a cross aisle leading to a side exit at intervals no greater than every fifteenth row, then only one side court will be required.

(3) If the first floor is fireproof and not more than 500 persons are accommodated, then only one side or rear court will be required.

The width of every exit court shall be at least 6 feet if the total seating capacity is not over 500 persons, and shall be increased at the rate of one foot per 500 persons additional. Every such court shall lead to a public thoroughfare, either directly, or through a passageway of equal width, not less than 8 feet high, and having unpierced standard fire walls, and fireproof ceiling and floor designed for a live load of at least 150 pounds per square foot. No such court or passageway shall be used for storage or any other purpose whatsoever, except for egress and ingress.

Section 61. Buildings Used for Other Purposes

No sleeping room or apartment shall be placed over a theatre which has a stage unless the entire building is of fireproof construction.

No assembly hall shall be placed over a garage, unless separated therefrom by an unpierced fireproof floor.

Every theatre or assembly hall built in connection with or as a part of a building used for other purposes, shall be separated from such other parts of the building by standard fire walls, except in the following cases:

(1) fireproof private assembly halls.

(2) non-fireproof private assembly halls accommodating not more than 400 persons.

(3) halls in fireproof hotels accommodating not more than 400 persons.

(4) in non-fireproof buildings, standard fireproof partitions may be used instead of fire walls.

Section 62. Capacity

The capacity of a theatre or assembly hall shall be established by the actual number of permanently fixed seats, plus an allowance of one person for every 3 square feet where "standing room" is provided. Such "standing room" shall not include any aisle, passageway, or lobby. Where permanently fixed seats are not provided, the capacity shall be established by allowing 15 square feet of clear floor space per person in halls used as dining room or dance halls only, or 6 square feet per person in all other halls. (See Section 64.)

No greater number of persons than the number thus established shall be permitted in any theatre or assembly hall.

Section 63. Exits

Number and Location. Every theatre and assembly hall shall have two or more exits, placed as far apart as practicable, and so located that if any exit is blocked, some other exit will still be accessible from every part. Theatre exits shall be distributed on all open sides of the building. (See Section 60 and the paragraph in this section entitled "Width of Exits.")

This section shall apply separately to the main floor and to each balcony or gallery which seats more than 50 persons, if in a theatre; or more than 100 persons, if in a non-fireproof assembly hall; or more than 150 persons, if in a fireproof assembly hall; also to the stage, dressing room section, and other employes' room.

Type of Exits. Exits from the first door shall be standard exit doors with incline or steps to grade; if the doorsill is below grade, an incline shall be used, except that a private assembly hall may have a stairway exit, from subgrade, of not more than ten risers in all. No part of any incline shall have a rise of more than one foot in five. Exits from upper floors, balconies, and galleries shall be stairways, horizontal exits, fire escapes or inclines.

Stairways. Every stairway in a theatre, public assembly hall, or non-fireproof private assembly hall, except stairways from the main floor to the first balcony, shall be enclosed. No storage closet shall be placed under any stairway.

Stairways and steps which have more than three risers shall have handrails on both sides.

Every stairway used by the public in a theatre or public assembly hall, shall have a uniform rise of not more than 7½ inches and a uniform tread of not less than 10 inches, measured from tread to tread and from riser to riser; no winders shall be used; there shall be not less than three nor more than sixteen risers in any run.

Fire Escapes. All fire escapes shall be "B" fire escapes (Section 22) except that "A" fire escapes may be used for balconies which accommodate not more than 100 persons.

Note. Fire escape stairways with solid platforms and treads, and covered by a roof, are recommended. Such stairways may be used as regular exits, thus adding to the comfort of the audience and also decreasing the danger of panic.

Exit Doors. Every required exit door (whether usual or emergency) shall be a standard exit door.

No single door or leaf to a double door, shall be more than 4 feet wide. No two doors shall be hinged together.

No rolling, sliding or revolving door shall be counted as an exit from any theatre or assembly hall, nor shall any such door be permitted in any theatre where it would be liable to be used by the public as an exit.

Sills at all exits shall be level and flush with adjacent inside floors, and such floors shall extend without break in the level or gradient for a distance not less than the width of the adjacent aisle.

(For exit lights and signs see Section 71.)

Width of Exits. The total width of exits from every theatre and assembly hall, and from every part thereof, shall be at not less than the following rates:

Theatres, non-fireproof, 40 inches per 100 persons.

Theatres, fireproof (except roof), 36 inches per 100 persons. In theatres, the width of the front entrance or entrances shall be at least one-half of the total required width.

Assembly halls, non-fireproof, 36 inches per 100 persons.

Assembly halls, fireproof, 30 inches per 100 persons.

Section 64. Seats

All seats, chairs and benches shall be placed not less than 32 inches for adults, or 30 inches for minors, from back to back measured horizontally; except that folding seats of approved design, with backs not more than ½ inch thick, also fixed seats on an approximately level floor in an assembly hall, may be placed not less than 30 inches back to back, for the use of adults as well as minors. If benches without arms between seats are used, the seating capacity shall be established by allowing one sitting or seat to each 18 inches of length.

All seats, chairs and benches, except chairs in boxes or loggias, shall be securely fastened to the floor; or if the floor is level, the seats or chairs may be fastened together in groups of four or more.

Note. Loose chairs or seats must not be used unless a written permit is obtained from the Chief of the City Fire Department.

This requirement does not apply to restaurants, dining or dance halls.

There shall be not more than 12 seats in a row between aisles, nor more than 5 seats in a row which has an aisle on one side only.

No seat, bench or platform on which seats are placed shall be more than 22 inches in height of riser. No such seat bench shall be nearer the ceiling than 8 feet.

(To be continued)

Estimating Bureau Overcomes Defects

A Central Agency for Quantity Surveying, Compiling Estimating Data and Exchanging Bids Would Put Competitive Tendering on a New Basis of Efficiency and Usefulness

A central estimating bureau furnishes an impartial, economic service prepared in co-operation with the owner, architect or engineer, contractor or builder, the manufacturer of building materials and his dealer. Without any direct individual commercial interest in the various units of the industry, it can best serve to benefit the entire group, without restraint. The work of a central estimating bureau, best exemplified in its quantity surveys, saves the time of the architect or engineer, provides a check which is invaluable to the owner, and prevents duplication of effort in contractors' estimates, from which bids are prepared. Further reference to the value of the central estimating bureau was recently contained in an article by G. Szmak in "Contractors' and Engineers' Monthly."

The major purpose of a central estimating bureau the article states, is to provide a systematic and equalized method for competitive bidding, by classifying openly and in the simplest way the real value of materials and labor as compared with the price. The needs of bureaus conducted on these principles is obvious to any one in the building industry. Criticisms of certain practices which have been carried on in the building industry make the use of such a bureau practically imperative, as it permits public inquiry at all times. No fair-minded person would look on in toleration at a competitive foot race where the contestants did not start off on an equalized basis, and even less would he care to enter it; yet such are the conditions in the building industry under the system in use for competitive bids. The evils of this system are reaped by everyone, just as the benefits of a definite quantity survey will be gained by everyone.

It is true that the ability of any contractor or builder to perform work of any type or character with his organization and plant is very different from that of every other contractor or builder, but these inequalities may be overcome by careful selection, and the owners' opinion may be gauged by the past performance of the contractor.

Uncertainty of Present Methods

The greatest evil in construction lies in the uncertainty of the methods used by contractors in submitting their respective bids, for there are as many lists of quantities and labor costs as there are bidders, and material costs are priced from as many quotations as are procurable by each particular contractor, regardless of specific quantities or qualities. The result is a mass of figures ranging from 1 to 35 per cent under or over the normal cost. Can this truly be called fair competition.

The compilation of productive data prepared accurately and simply and assuming full responsibility for the work, which would require no further duplication of effort after it had been done, would indeed be a valuable service and greatly eliminate worry and waste. It is within the scope of central estimating bureaus to give such service if given ample co-operation, time for preparation and the requisite fundamental information about plans and specifications. It is possible to classify and summarize only such works as are given in detail, which are measurable in quantity, described in quality and made clear as to conditions. These factors are characteristic of nearly every kind, class or type of work upon which organizations may bid. The few occurring uncertain conditions that cannot be contracted at predetermined costs should ethically be numerized and recorded for the consideration of the owner and the contractor.

The contact of the central estimating bureau with every unit of the building industry enables it to gather a vast amount of information and to distribute it in the form of leaflets and bulletins among the industry and so greatly promote the commercial and ethical development of the profession and trade. Information in the preparation of the bureau's services, such as material and labor costs, current estimated square- and cubic-foot unit building costs, forms valuable statistics and should be generally accessible to the industry and its clientele. In this way bureaus can help to gain public confidence and stimulate business.

Fair Dealings

Contractors are always anxious to know the results of their bidding and are certainly entitled to a complete record showing the individual standing of each bidder, and thereby gain information which may be of future use. Without any definite office interested in the compilation of these facts, it nearly always happens that the contractor does not even receive thanks for the trouble and expense of estimating.

Sometimes contractors question whether they are receiving a fair deal from the owner, architect or engineer in spite of competitive bidding. This question can be overcome with absolute fairness through submitting sealed copies of their bids to the bureau whenever tendering a proposal. After the award is made, the figures of the competitive bids are openly passed to each bidder. In this way each receives positive insurance against unfair consideration.

Listings of materials with quantities are often required in the field and office for the purpose of ordering, but there is not the time necessary or competent help available to secure the information wanted. Bureaus engaged for this work are dependable and very convenient, and also save in costs.

Engineers and architects frequently place building supervisors on jobs calling for their services, but very often most of the supervisor's time is taken up in checking contractors' invoices, leaving very little time for actual building supervision. The job of thoroughly checking contractors' invoices of materials and labor is not part-time work. It requires expert knowledge of construction field accounting. Not only is this service valuable to owners, architects and engineers, but it is also to the advantage of contractors to employ bureaus offering such service, as they are more willing to assume greater responsibilities for the accuracy of the quantity surveys and in general for all their work, because they are continually in practical contact with field activities.

Those contractors desiring to increase their operating territories before submitting bids must make enquiries at the immediate locality of the proposed work, to determine the exact existing conditions locally as regards labor, materials, site of operation, transportation, etc. The central bureau is better fitted to make this report to the bidder, as it has in its possession, fully classified, most of this information, or if not, it can readily secure the exact information required at a minimum of expense.

Large Waste of Effort

Practically 85 per cent of the effort and expense of estimating by contractors or sub-contractors is absolute waste. In the case of the general contractor and the client, the latter likes to have a check upon the bids received. Central bureaus can give this service in positive confidence and with greater accuracy than by any amount of wasteful multiplication in the number of bidders and bids received. Under the prevailing methods for bidding, it would not make a particle of difference if nine bids out of ten were exactly alike, which is almost impossible with unlike quantities; the tenth bidder, who through inaccuracy of quantities submitted a lower bid and was financially responsible, would be awarded the contract, even though the bids were used to check against each other. Quantity surveys prevent this.

The general contractor as a rule does not figure every portion of the contract, but requests sub-contractors to submit quotations on various kinds of work. In the majority of cases this is not done to secure better bids in competition, but because it enables the general contractor to get a figure on that portion of the work—and they usually get several, many with very uncertain provisions and radical costs. It is within the scope of the central estimating bureau to provide these sub-bids without wasting the duplication to the industry at large, and, further such a bureau is in a position to secure responsible sub-bids for specialized work.

Contractors, engineers and architects are burdened with a great many tentative and speculative projects, which if referred to a central bureau, would result in a large saving of time and money to everyone concerned. A clientele desiring information for an active program would be likewise benefited. Construction appraisals needed by owners, realtors and bankers, unless re-estimated with definitely known material and labor rates, compiled from past and current values, are mere approximations. Rate records are always at the disposal of the clients of well-established bureaus.

Fundamental Benefits

The advantage of using a definite quantity survey of materials, and its labor applications are too numerous for mention within the confines of this article, but many are well recognized by most members of the building industry. Some of the results are better business, more skillful workmanship, the elimination of waste, efficient co-operation, fair costs and fair profits. All of these are obtained simply because the contractor or builder receives definite knowledge of the items of materials and labor for which he may be held responsible, before he assumes any obligations on the contract.

There is no need to gamble on work that may look good or bad at the start and that may turn out to be a bonanza or a failure at the finish. The contractor does not have to skimp on workmanship or quality of materials in order to build up profits which have been taken by unforeseen or omitted items, many times not entirely through his own fault. The elimination of uncertainty is sure to result in less duplication and waste. Efficient co-operation is always present where there is no need for selfish motives. Fair costs and profits can result only when estimates are compiled on like quantities, and all the bidders are thus placed on an equal plane. The current costs of materials, labor and profit contingencies do not permit much variation, and with a quantity survey bidding would become stabilized to such an extent as to command public respect and trust. The cost of preparing any individual survey is no greater than would have to be paid for a reliable estimate by each user, and in consideration of the advantage and merits of the central estimating bureau, the cost is negligible.

Advantages to the Owner

The owner ultimately saves a large sum which would have been spent in multiplied efforts used in wasteful estimating by contractors, builders, manufacturers and dealers in construction materials. In addition, there is a distinctive advantage in open dealing through equalized competition.

The engineer or architect is provided with an absolute check upon his plans and specifications before the contract is awarded, thereby avoiding endless trouble and inconvenient proceedings during construction. Reliable cost data are always at their disposal, which is necessary in the efficient designing of new projects. The lack of this information very often results in re-design or in loss of a client.

The contractor, builder and sub-contractor are relieved of cumbersome work in preparing quantity surveys and estimates, at least 85 per cent of which heretofore has been unfruitful effort.

The manufacturer and dealer, through the established use of specific qualities and quantities, will be able to develop new and productive territory with minimum effort and expense.

How Stone Buildings Should be Cleaned

Methods of Removing Surface Dirt—A Thorough Scrubbing Will Perform More Satisfactory Work than Acids or Sand-blasting—A Mistake to Remove the Natural Protection Coat

There is considerable literature pertaining to the cleaning, waterproofing and preserving of stone, but it is widely scattered, and is to be found only in the pages of technical periodicals. The subject has engaged the attention of scientific authorities, particularly in Great Britain, where the restoration of famous old buildings is always in progress. Much of the matter that has appeared in the English journals, however, has only a casual interest in this country, because of the difference in conditions. Hundreds of years ago, when many of the historic structures of England were erected, there was no scientific study of building materials, and, owing to the lack of transportation facilities, the stone nearest at hand was apt to be chosen. It is impossible to deny that much stone that would now be held entirely unfitted for building work was employed in the erection of great edifices in the past. Under the best of circumstances the English climate is very trying to stone work, because of the presence of immense quantities of sulphurous gases in the air, due to the universal consumption of soft coal. Magnesian limestone and the softer sandstones, the materials most frequently used, have disintegrated somewhat in weathering so that the study of the restorers has been to waterproof the stone and indurate the fresh surfaces exposed. But there is also the task of cleaning off the thick crust of soot and grime accumulated in the centuries. Old English practice has been to accomplish this by applying to the surface, with a long-handled fibre brush, a strong caustic solution of pearlash. This is allowed to remain on for about fifteen minutes, and then the surface is washed several times with clear water, using a stiff brush or broom for the purpose. If this does not prove effective enough the stone is scrubbed with soft soap and concentrated lye. This is allowed to remain on until nearly dry, and then the stone is rinsed with clear water, a brush being used to remove the cleansing material. It is, of course, necessary for the workman to protect his hands with rubber gloves. In some cases, where there are large and comparatively smooth surfaces, the stone is honed with a soft rubbing stone, several varieties for this purpose being held in favor by the trade.

Different Conditions on This Continent

On this continent, conditions are different. Our buildings are nothing like as old, and as a rule they are erected of more durable stone, and the problem is merely to remove surface dirt and not to arrest distintegration, or to work off a thick, encrusted grime. As a rule we are not fond of an atmosphere of antiquity in our buildings; we want everything to look spick and span new. We lose sight of the fact that the mellowing influence of time is a great beautifier of architectural work. The fresh scars on hillsides or mountains sometimes made by the cataclysms of nature or man's handiwork distress us until they are gradually healed and covered over by kindly time. Yet, nevertheless, when we cut a stone and set it in a building we seem to think that it should always retain its pristine freshness, even if the color, when it comes from the chisel, is a bit dazzling or harsh. Buildings have been cleaned when the laborous process has robbed them of a distinct part of their charm. The first point to insist upon, therefore, in any discussion of the cleaning of stone, is to be sure that the building actually needs cleaning and will be improved thereby. Here is a case in point. A business man recently purchased a marble building in lower New York that was erected nearly, if not quite, a hundred years ago. He remodelled the interior at considerable expense, and now is distressed because the exterior isn't as bright and fresh as a new structure. And yet, the building is not stained or disfigured, and its appearance is dignified and mellowed by time. To scrape off this kindly coating, which is in reality merely a protective skin formed by nature, would weaken the resistance of the stone and prove of the most doubtful aesthetic value. It would be like dissolving off the beautiful patina from an old bronze or the iridescence of ancient glass.

Cause of Stains

There is still another point to be made. There are buildings that are undeniably blotched and stained, due to errors of construction. We have stated many times that there is no standard and approved stone used for building in this country that contains within itself the elements of staining.

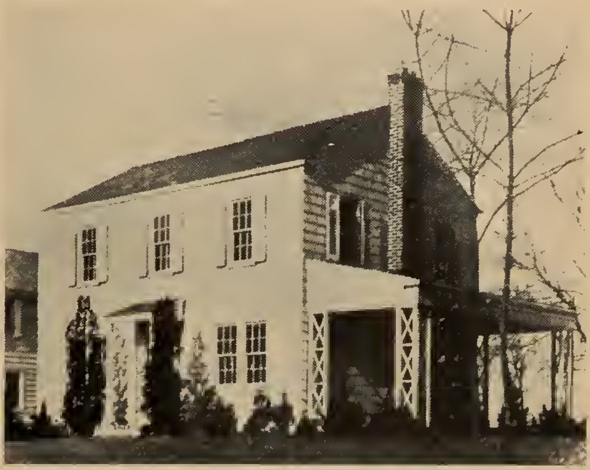
Those stones which contain free iron or mineral elements that change and discolor the surface have fallen into disfavor and been rejected. Every stone, however, is more or less absorptive and can take into its pores discoloring matter with which it is brought into contact. Portland cement, for instance, will always stain stone, and unless stone can be set in lime mortar, the back, beds and joints of each block must be thoroughly covered with a protective paint. But even so, some of the discoloring moisture may find its way to the pores of the stone and work by capillarity to the surface. Or the water from concreting within the building may flow down the exterior, thus occasioning staining. Scrupulous care will prevent these accidents, and the standard specifications, issued by the Indiana Limestone Quarrymen's Association, give full directions, by which they may be avoided. If, however, there is staining of

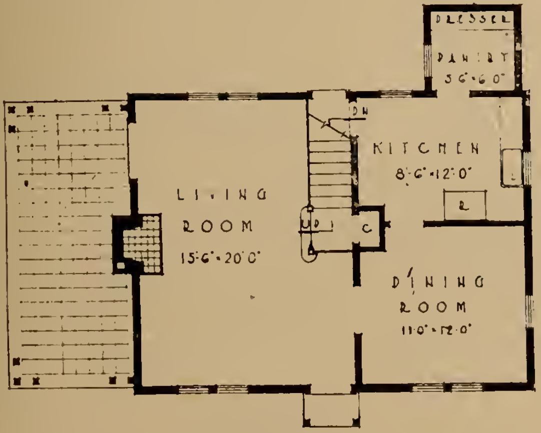
The Contract Record's

Weekly House Suggestion No. 81

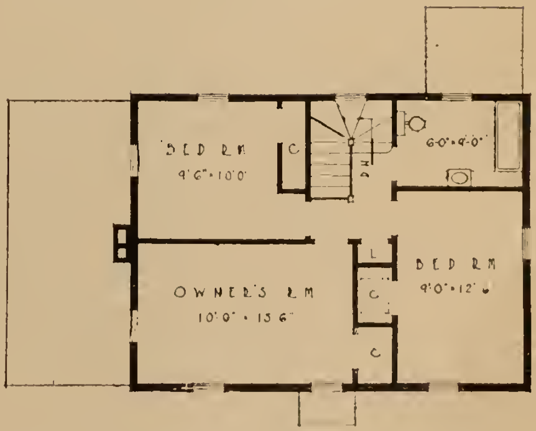
A New England Colonial frame house that has a genuine homey appeal and that combines compactness with dignity and comfort is shown in the accompanying illustrations. The cost of this structure was $6,745 which price includes a 10 per cent margin of profit allowed the contractor. The average cost per room was $1,124.24. There are three main rooms on the ground floor, namely, living room, dining room and kitchen, with pantry. The second floor has three bed rooms and tiled bath. The general construction is frame and the roofing is of wood shingles left unstained to weather. The full width verandah at the side is laid with a tile flooring. There is an entrance from the verandah on the large living room which occupies half of the ground floor space. This room is equipped with brick fireplace and main staircase s located here, as seen on reproduced plan.

The upstairs arrangement is ideal, the rooms being large and conveniently laid out. This is an excellent type of moderate priced home and should appeal strongly to the prospective house builder.





FIRST FLOOR PLAN



SECOND FLOOR PLAN

this nature, the best remedy is time. Sunshine and the weather may generally be depended upon to restore the stone to its natural color.

Use of Acid is Undesirable

The use of acid for cleansing is always to be deprecated. Sufficiently diluted and applied with extreme care, it may do no harm, but it is a dangerous expedient to entrust to the ordinary workman, and it may burn the stone so that its last state is worse than its first. Under no circumstances should sand-blasting be permitted. Stone always indurates on the surface by exposure, and sand-blasting removes this protective coat and shortens the natural life of the stone. Wire brushes should never be used in washing down a building, for these will inevitably cause rusting.

The experience of the most careful and observant stone contractors has been that the best method of cleaning any kind of stone building is a thorough scrubbing. Prepare a wash of soft water and about one and a half bars of common laundry soap. Boil until the soap has been thoroughly dissolved. Add a fine, clean, gritty sand (white, preferred), and mix to about the consistency of putty. While mixing, add about five tablespoons of ammonia per bucket of water. With this preparation scrub the surface with a stiff fibre scrubbing brush. Wash down with a stream of water from a hose, and then go over it again with the scrubbing brush.—Stone.

Mainly Constructional

East and West—From Coast to Coast

A proposition has been made to the City Council of Three Rivers, P. Q., for the purchase of the Steel Foundry. It is the intention of the company to make alterations in the plant and install the necessary machinery for the manufacturing of steel products by electricity.

The development of 30,000 horsepower at Hemmings Falls, on the St. Francis River, near Drummondville, P.Q., has now definitely been decided upon by the Southern Canada Power Co. Ltd. it is reported, and the contract for the construction work in connection with this development has just been awarded to the Foundation Company, Limited, of Canada. The engineers of Southern Canada Power Company have been working on plans for the development of the power site at Hemmings Falls for the past few months, and following the granting of the contract, it is understood the preliminary work will commence at once.

A large piece of land in Waverley Park, north Yonge St., Toronto, has been sold by a local real estate firm to J. E. McMillan, builder, who plans an extensive housing development to involve an ultimate expenditure of about $400,000.

Goderich, Ont., will undertake shortly the extension and enlargement of the present intake at an estimated cost of $75,000. The work will be carried out under the direction of the Provincial Board of Health.

First and largest of three new bridges which are to be built over the Thompson River near Kamloops, B. C., is a steel, through-truss span which the provincial public works department will erect in the near future. The appropriation for this bridge, which is located just on the outskirts of the city of Kamloops, has been passed by the provincial government and tenders are now being invited by the public works department for the construction of both the concrete abutments and sub-structure, as well as the superstructure and span. The cost of the completed bridge has been estimated by the engineers of the public works department to be in the neighborhood of $180,000.

Finance Commissioner Ross, of Toronto, in his annual statement, says: During the next few years the city will have to face many very large items of capital expenditure for special purposes, aggregating in the neighborhood of $60,000,000. Included in this list are the following: Acquisition award, Toronto Railway Company: city's share of cost of railway viaduct on the water front and grade separation in north-west section of the city; drainage system for North Toronto; consolidation and extension of the municipally owned light and power system; extensions and new equipment for the Transportation System; duplicate waterworks system.

Reclamation of upwards of 1600 acres of land in South Westminster, B. C., has been started this week by the A. B. Palmer Co. Ltd., who have been awarded the contract for the construction of a dyke extending along the waterfront both above and below the southern approach to the Fraser river bridge.

City Architect's plans for a $40,000 shelter in High Park, Toronto, were submitted to the Board of Control recently. The money was provided for in last year's estimates. The location is to be at the east brow of the ravine, south of Bloor St. W., near the open land.

Prospects are good for a busy winter construction season at Hamilton, Ont., this year, with the following new buildings under way: Westinghouse building, new collegiate, Lister Building and new hospital, besides the usual amount of small construction.

The old Grand Trunk overhead bridge east of the city of Brandon, Man., which was never completed, may be pulled down shortly and the lumber sold. The bridge is a mile long and contains over 350,000 feet of lumber. It was built when a line from Harte into the city was planned, which plan was cancelled later and the work discontinued. The bridge has stood since 1909, but the timber is said to be as good as ever.

The Catholic School Commission at Montreal was recently granted a permit to erect a school building on St. Joseph Boulevard, to cost $142,000.

Plans are to be prepared and the costs secured for a new bridge to cross the Grand River at Main street, Galt, Ont., to secure data for the submission of a bylaw to the ratepayers at the municipal elections next New Year's Day. Since the war there has been an agitation for the erection of a memorial bridge.

There is a rumor of a new 150-room hotel at the Harrison Hot Springs, B.C. For three years, since the big frame hotel was destroyed by fire, this resort has been idle, but a Vancouver firm is said to have purchased the old St. Alice property and plans to re-establish this resort.

While on a tour of the harbor developments at Toronto recently, Hon. Dr. King, minister of public works, stated that the Dominion Government will carry on with the plans for the completion of the breakwater down to Bathurst St., a distance of 4,000 ft., which will provide a continuous breakwater wall from Bathurst St. to the Humber.

Personal

Mr. M. C. H. Little has joined the sales force of Northern Explosives Limited, and is representing that company in the Cobalt and South Porcupine districts of Ontario. Mr. Little has been connected with mining in this district for a considerable time and is well known throughout the northern part of the province. He has recently returned from a trip to Italy.

Mr. M. H. Ferguson, of Toronto, has been appointed town engineer of Port Hope, Ont.

CONSTRUCTIONAL ACTIVITY

Period of August 29 to Sept. 4, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Cowansville, Que.
Tenders are being received by secretary, Frank Hulburd, till September 10 for sewers. Plans and specifications at office of Leon Desrochers; P.L.S.; Waterloo, Ont.

Etobicoke Twp., Ont.
Tenders are being received by N. MacNicol, engineer, Islington, Ont., till September 6 for construction of 19,300 sq. ft. of concrete sidewalks. Plans and specifications with engineer.

Goderich, Ont.
The town council contemplates enlarging the intake pipe at a cost of $50,000.

Hamilton, Ont.
Work is now in progress on water mains on Ottawa St. and Main St. to Mountain St.

Lasalle, Que.
Tenders being received by S. Lefebvre, secretary-treasurer, till September 5 for extension of water and sewage systems. Plans and specifications with J. A. Roy, engineer, 71a St. James St., Montreal, Que.

Leamington, Ont.
The town council contemplate the laying of concrete pavements to cost $12,000.

Marchwell, Sask.
Tenders will be received by H. S. Carpenter, deputy minister of highways, Department of Highways, Regina, Sask., until Wednesday, September 12, for the excavation of 28,000 cu. yds. of earth and other work required in the construction of a provincial highway from Marchwell to Langenburg, Sask. Plans and specifications with the department.

Montreal, Que.
Tenders being received by executive committee till September 10 for supply of gate valves for distribution control building and the 48 in. main. Plans and specifications at office of Montreal Water Board, Atwater St.

Peel County, Ont.
Tenders are being received by county road superintendent, N. L. Powell, Brampton, Ont., till September 6 for 500 cu. yds. of grading.

Riverside, Ont.
Tenders are being received by C. J. McHugh, clerk, till September 6 for laying of sewers, Riverside Drive interceptor and Ottawa St. trunk sewers to cost $90,000.

Trenton, N. S.
Tenders have been received by the town council for the installation of 8 in. sewers and water mains.

York Twp., Ont.
Tenders are being received till September 8, by F. B. Goedike, engineer, 40 Jarvis St., Toronto, for construction of the following watermains: Eglinton, Gledhill and Woodbine Aves., and Forest Hill Road. Plans and specifications with engineer.

Tenders are being received till September 8, by F. B. Goedike, engineer, 40 Jarvis St, Toronto, for construction of sidewalks.

CONTRACTS AWARDED

Dundas, Ont.
The town council has awarded J. D. Armstrong Co., Hamilton, Ont., the contract for sewers.

Province of Quebec.
Thomas Desbiens, St. Louis de Chambord, Que., has received the contract for gravelling St Bruno-Robervale-St. Bruno and Levis-Sherbrooke highways.

St. Lambert, Que.
The town council has awarded Quinlan, Robertson & Janin, Ltd., Montreal, the contract for paving to cost $95,000.

The town council has awarded W. I. Bishop Limited, Montreal, the contract for waterworks at $50,600.

Toronto, Ont.
Contracts for bitulithic pavements have been awarded as follows: Elmer and Woodmount $30,223 — Commissioner of Works; Haslett, Isleworth, Rhyl and Wolverleigh $56,604—Warren Bituminous Paving Co.

Contracts for asphalt pavements have been awarded as follows: Cinder and Stafford $16,066—Constructing & Paving Co.; Lawlor and Wolverleigh $29,163—Kilmer and Barber.

Weston, Ont.
The contract for sewers has been awarded to G. B. Moogk, Weston, Ont.

York Twp., Ont.
The town council has awarded the following contracts in connection with watermains: Criscoe St. $600, Falwyn $300, Cosburn $700 and May $400—F. B. Goedike, 40 Jarvis St.; Bicknell, Chorley and Gilpin Aves. at $1,300—F. C. Shipp, 1609 Queen W.; Nash, Floyd and Logan Aves. $3,400—Gordon Thompson, 55 Holland Park; Roselawn Ave. $750—Murphy Contracting Co., 8 Wychwood Park. All of Toronto.

Public Buildings, Churches and Schools

Asbestos, Que.
Tenders are being received by L. N. Audet, architect, 32 Wellington St. N., Sherbrooke, Que., for the erection of a $250,000 church; 1 storey, 30 x 180. Plans and specifications with the architect.

Banff, Alta.
Plans are being prepared for a $50,000 school. MacDonald & Magoon, Edmonton, Alta., are the architects.

Hamilton, Ont.
Tenders are being received by secretary, R. H. Foster, till September 5 on electric, plumbing, heating and ventilating, in connection with collegiate being built on Main St. E.

Jansen, Sask.
Tenders will be received by the secretary, J. W. McDonald, till September 5 for the building and erecting, construction and furnishing all equipment for a school building. Plans and specifications with secretary.

Kimberley, B. C.
Tenders will be received by the Minister of Public Works till September 7 for the building of a school. Plans and specifications with government agents, Vancouver and Cranbrook; also Dept. of Public Works, Victoria, B. C.

Makepeace, Alta.
Tenders will be received by the secretary-treasurer Alex. Befus, till September 5 for the erection of a frame school building. Plans and specifications with secretary-treasurer.

St. Catharines, Ont.
Tenders are being received by general superintendent, E. W. Oliver, 1 Toronto St., Toronto, Ont., till September 8 in connection with terminal building to be built corner Geneva St. and Welland Ave.

Thorold, Ont.
Bulk or separate tenders being received till September 17, by secretary, Frank Pew, Water St., and Nicholson & Macbeth, architects, St. Catharines, Ont., for the erection of a $60,000 school.

Toronto, Ont.
The Third Church of Christ (Scientist) contemplate building a church on the west side High Park Ave. near Glenlake Ave.

CONTRACTS AWARDED

Barrie, Ont.
Contracts for new plumbing and heating of King Edward School have been awarded as follows: elevations and masonry work—Thos. Cooke; sanitary floor—Sanitary Flooring Co. of Toronto; plumbing—A. Moffatt; heating—Findlay Bros.

Brooklin, Ont.
The foundations are in for a $30,000 school. The following sub-trades have been let: plumbing and heating—J. McIntyre, Whitby, Ont.; painting and glazing—Thos. Morrow, Woodville, Ont.

Guelph, Ont.
The contract for plumbing and heating of $137,000 memorial hall has been

awarded to Purdy & Mansell Ltd., Toronto.

Haileybury, Ont.
The contract for millwork in connection with $150,000 court house has been awarded to Knight Bros., Burks Falls, Ont.

The contract for plumbing and heating of new court house has been awarded to Purdy Mansell, Ltd., Toronto.

Indian Reserve, B. C.
Work is to start at once on an Indian boarding school, near Kamloops. Thos. Carson, Vancouver, B. C., is the general contractor.

Katrine, Ont.
G. Brown, Bracebridge, Ont., is the general contractor in connection with $5,990 school to be built.

Kapuskasing, Ont.
P. C. Marceau, North Bay, has received the general contract for $30,000 school; 2 stories, brick veneer construction. Prices wanted on seating, blackboards and heating apparatus.

Kitchener, Ont.
Dunker Bros., Kitchener, Ont., have received the general contract for alterations and addition to House of Refuge to cost $100,000.

Lazare, Man.
Oscar Dupont is the general contractor for a $7,000 church being built on Queen St. for the Roman Catholic Church congregation.

Lampman, Sask.
Oscar Lund, Estevan, Sask., is the general contractor of a $5,000 church being built for the R. C. Episcopal Corporation.

Leaside, Ont.
The following sub-trades have been let in connection with $44,000 school being built; electric wiring, plumbing and heating—Mechanical Trades Co., Ltd.; glazing and painting—S. J. Lane & Co.; roofing and sheet metal—E. Lankin & Son, Ltd.; structural steel—McGregor & McIntyre, Ltd.; steel sash—Innes-Lawrie, Ltd.; plastering—A. Petrie & Co. All of Toronto.

Milestone, Sask.
Work is to start at once on addition to school at a cost of $13,000. Bird & Woodall, Moose Jaw, Sask., are the general contractors.

Montreal, Que.
The following sub-trades have been let in connection with church basement at 1854 Notre Dame East; reinforced steel—Trussed Concrete Steel Co., Ltd.; millwork—Allard & Desnoyers; roofing—M. Chouinard; electric—W. Rochon; plumbing and heating—Chouinard & Ottis; ornamental iron—Gravel & Drouin.

The following contracts have been awarded in connection with school being built on Cote St. Paul; roofing—Metal Shingle & Siding Co.; painting and glazing—Curwood & Co.

Ottawa, Ont.
The contract for superstructure of palm house to cost $6,500 has been awarded to the King Construction Co. Ltd., Toronto.

Oakville, Ont.
The foundations are in for a $46,400 school on Reynolds street. The following sub trades have been let; electric—B. E. Sprowe; plumbing and heating—Geo. Kemp; painting—H. W. French; plastering—John Andrew.

Rimouski, Que.
The contract for metal furring and lathing in chapel in connection with new seminary costing $600,000, has been awarded to E. Dussault, Bordeaux street, Montreal, at $11,200.

Scarboro Twp., Ont.
The contracts for plumbing, coal bunkers and septic tank in connection with Oakridges school, have been awarded as follows: concrete work for tank and coal bunker—Saunders & Hardy; plumbing—Geo. Strachan.

St. Jean De Dieu, Que.
Frs. Deschesnes, Riviere Du Loup, Que., has the contract for heating in connection with $20,000 model school being built.

St. Anne de Bellevue, Que.
The contract for alterations to military hospital to cost $12,475, has been awarded to Laurie Engine Co., Montreal Que.

St. Hyacinthe, Que.
The foundations are in for a $5,500 school. Jos. Chabot, 155 Bourdages St., is the general contractor.

Verdun, Que.
The following contracts have been awarded in connection with $50,000 church being built corner Wellington and Gordon avenues; roofing—Metal Shingle & Siding Co.; painting and glazing—Curwood & Co.

Vibank, Sask.
J. P. O'Leary, Regina, Sask., is the general contractor of a $44,500 convent being built for the Ursuline Sisters; 3 stories and basement, 110 x 48, brick and tile construction.

Victoria, B. C.
Luney Bros. Ltd., are the general contractors for a marine terminal building to be erected on Belleville street for the Canadian Pacific Railway at a cost of $150,000.

Whitby, Ont.
Purdy Mansell Ltd., Toronto, have received the contract for steam heating of Ontario Hospital administration building.

Business Buildings and Industrial Plants

Hamilton, Ont.
Tenders are being received by the Manager, Mr. Dunn, no closing date set, for the building of a storehouse at 95 Main street, for G. S. Dunn & Co. 1 story and basement, 33x160x28 ft. high, brick construction.

Hamilton West, Ont.
Plans are being prepared for an office and storage building for Tolman & Co.

Merritt, B. C.
Work is to start at once on I. O. O. F. Hall to be built on Main street at a cost of $10,000.

Medicine Hat, Alta.
The Lake of the Woods Milling Co., Ltd., contemplate building an addition to warehouse and elevator at a cost of $50,000.

Midland, Ont.
The rebuilding of 2 stores to cost $10,000 is contemplated by Victor Edwards, owner.

Niagara Falls, Ont.
Tenders will be received by the architect, C. M. Borter, 102 Main street, till September 10 for the construction of a $59,000 arena. 1 story, 140x280 cement and stucco construction.

Toronto, Ont.
The British Woolens, Ltd., contemplate building a $75,000 factory on Eastern avenue. N. A. Armstrong Co., Ltd., Toronto, are the architects.

Tenders are being received by the architects, Molesworth, West & Secord, 43 Victoria street, till September 10 for general trades work in connection with alterations to Y.W.C.A. Headquarters. Plans and specifications for mechanical trades will be ready about September 3.

Winipeg, Man.
W. A. Irish & Co., 315 Kennedy building, Winnipeg, Man., are the owners and builders of 3 stores north side Portage avenue and desire prices at once on all sub trades; 1 story, 42 x 40, tile and stucco construction.

CONTRACTS AWARDED

Antigonish, N. S.
Russell & Macauley, Halifax, N. S., are the general contractors of an office building being built for the Bank of Nova Scotia; excavating—Arthur W. Girrior; heating and plumbing—Sears & McIntosh.

Clemens, Alta.
Work is to start at once on $16,000 elevator being built for the Lake of the Woods Milling Co., Ltd. R. O. Bunnell, Moose Jaw, Sask., is the general contractor and will purchase all materials.

Edmonton, Alta.
Work has commenced on $60,000 store building being built on 101st Street. Carter, Halls, Aldinger Co., Edmonton, are the general contractors.

Haileybury, Ont.
The following sub-trades have been let on $30,000 bank being built on Main St.: steel—Hamilton Bridge Co., Ltd.; cut stone—Nicholson, Curtis & Vick; sheet metal—Douglas Bros.; millwork—Buyer's Door & Mfg. Co., Ltd.

Hamilton, Ont.
J. R. Isbister is the general contractor for a $7,000 gasoline station corner Merrick and York streets.

Lac Verte, Sask.
R. O. Bunnell, Moose Jaw, Sask., is the general contractor of a $16,000 elevator being built for the Lake of the Woods Milling Co. Ltd.

Lunenburg, N. S.
The following sub trades have been let on $25,000 masonic temple: masonry—Frank A. Young; electric—Lunenburg Gas Co ; heating and plumbing—Frank Powers.

Montreal, Que.
Fussing & Jorgensen are the general

contractors for a varnish factory being built on Hopper avenue.

The following sub trades have been let in connection with $10,000 gymnasium rear 697 St. Urban St.; structural steel—McKinnon Steel Co., Ltd.; roofing, plumbing and heating—Mr. Goldberg, St. Urban street.

The foundations are going in for a $7,000 residence on Parthenais; 2 stories 30 x 46, frame and brick construction. The general contractors are Corp. Des Lagements Ouvriers, 195 St. Catherine East.

The Metal Shingle & Siding Co. have the contract for roofing of $8,000 factory being built at 33 Lenoir street for the Berliner Gramaphone Co.

Jas. Shearer & Co., Ltd., are the general contractors for a $6,000 factory being built on St. Patrick street for the Canada Axe & Harvest Tool Mfg. Co., Ltd.

J. Stormont, 3 Concord street, is the general contractor for repairs to theatre, $7,000, at 1374 Notre Dame street.

The stone work is now going up for addition to office building at Dorchester and Mansfield streets. Hollow tile is being supplied by the National Fireproof Co. of Canada, Ltd., Toronto.

Denise Contracting Co. have been awarded the contract for alterations to building on Montfort street, and want prices on lumber, plumbing, electric, cement, sand, stone, waterproofing etc.

Niagara Falls, Ont.

Standard Steel Construction Co., Welland, Ont., have received the contract for steel work at $18,200 in connection with arena to be built on Victoria Ave.

Ottawa, Ont.

McKinley & Northwood have the contract for plumbing, and W. Green the plastering, in connection with $40,000 office building being built on Queen St.

Oka, Que.

Closse Construction Co., Montreal, Que., are the general contractors for a $79,000 Rest House to be owned by the Gentlemen of St. Sulpice. The architect is Eug. Payette, 103 St. Francois Xavier St., Montreal.

Oshawa, Ont.

The following contracts have been awarded in connection with assembly building and shipping shed for General Motors of Canada, Ltd.; cut stone—Hurst & Rogers; steel sash—Canadian Metal Window & Steel Products Ltd.; rolling steel doors—A. B. Ormsby & Co., Ltd.; electric wiring and fixtures—Canada Electric Co.; painting—Fred G. Roberts & Co., Ltd.; sprinklers—Grinnell Co. of Canada, Ltd. All of Toronto. Plumbing and heating—Miller & Libbey, Oshawa, Ont.

Quebec, Que.

The contract for heating alterations of examining warehouse to cost $6,000 has been awarded to Brousseau & Frere, 324 St. Paul St.

Sault Ste. Marie, Ont.

The following sub-trades have been let on 3 store block to cost $15,000 on Queen St.: electric—Taylor Bros.; plumbing—Dunseath & McLary; heating—Ed. Keyes; plastering—Hojen Bros.; painting—Lightfoot Bros.

Thetford Mines, Que.

Joseph Daigle is the general contractor for a $35,000 bank for La Banque Nationale; 3 stories, 50 x 50, stone and brick construction.

Toronto, Ont.

The brickwork is now going up for $40,000 addition to plant of the Ideal Bread Company. The following sub trades have been let; tile—National Fire Proofing Co. of Canada, Ltd.; heating and plumbing—Robt. Jordan; steel—Dominion Bridge Co., Ltd.; steel sash—Canadian Metal Window & Steel Products Ltd.

Vancouver, B. C.

The following contracts have been awarded in connection with the remodelling of block at 25 Hastings St. W., for Fred Buscombe, 525 Seymour St.: general contract, E. D. Cook & Co., 1016 Rogers Bldg., Vancouver; electrical work, Jenkins Electric Co., 546 Main St., Vancouver; plumbing, Barr & Anderson, 1060 Homer St., Vancouver; tiling, Wm. N. O'Neil Co. Ltd., 536 Howe St., Vancouver; fixtures, Dixon & Murray, 1065 Dunsmuir St., Vancouver; refrigeration, Linde Canadian Refrigeration Co., 500 Campbell Ave., Vancouver. Plastering and painting not let yet.

Western Construction Co., Ltd., are the general contractors for alterations to office building of the Dominion Express Co., Ltd., to cost $3,000.

G. Sutherland is the general contractor for alterations to store at 794 Main street, to cost $6,000.

Winnipeg, Man.

Messrs. Jones & Harris are building a $19,000 warehouse at the northeast corner of Whyte & Vine Sts., Winnipeg. Sutherland Construction Co. Ltd., 301 Lombard Bldg., Winnipeg, Man., are the general contractors. Owners address c/o general contractors.

Messrs. Carter Halls Aldinger Co., Union Bank Bldg., Winnipeg, have been awarded the general contract for an addition to bakery of Speirs Parnell Baking Co. Ltd., 666 Elgin Ave., at $79,929. Jordon & Over, 47 C.P.R. Bldg., are the architects.

Railroads, Bridges and Wharves

Blackville, N. B.

Tenders are being received by P. J. Veniot, Parliament Buildings, Fredericton, N. B., till September 5 for a concrete arch culvert and roadway embankment. Plans and specifications at Dep't. office of provincial tax inspector, St. John, N. B.; residence of Abraham V. Vanderbeck, Millerton, and at Underhill's post office.

Galt, Ont.

The city council propose building a single span bridge across the River at Main St. J. D. Black is the engineer.

Gosfield South Twp., Ont.

Tenders are being received by J. H. Coatsworth, township clerk, Kingsville, Ont., till September 8 for concrete reinforced bridge. Plans and specifications with clerk.

Porpoise Bay, B.C.

The Dominion Government, Department of Public Works, through the secretary, R. C. Desrochers, Ottawa, Ont., are receiving tenders until noon, Tuesday September 25 for the construction of a pile bent and timber decking wharf and float at Porpoise Bay. Plans and specifications are with the Department at Ottawa.

St. Victor, Que.

The town council contemplate the erection of bridge on the Lambton and Sherbrooke highway and are in the market for cement.

St. Polycarpe, Que.

Plans are being prepared for a $15,000 bridge. Ivan E. Vallee is the engineer.

Sandwich West, Ont.

Tenders are being received by Ernest Bondy, clerk, till September 6 for 3 concrete bridges and drain "Menard." Plans and specifications with clerk and J. J. Newman, engineer, Davis Bldg., Windsor, Ont.

Terrace, B. C.

Separate tenders will be received by the Minister of Public Works for the substructure and superstructure of bridge across Skeena River. Plans and specifications with Dept. of Public Works, Victoria, B. C.

CONTRACTS AWARDED

Adelaide Twp., Ont.

The township council has awarded contract for concrete bridge, to Don. Graham, Kerwood, Ont.

Cap St. Ignace, Que.

Theophile Beaumont & J. Emile Collin, Montmagny, Que., have been awarded the contract for building concrete bridge, at $4,898.30.

Cobourg, Ont.

The contract for reconstruction of east pier superstructure to cost $18,000 has been awarded to V. T. Bartram, Toronto.

Markham Twp., Ont.

The township council has awarded the contract for building of bridge to Hector Patterson, Gormley, Ont.

Mildmay, Ont.

The town council has awarded the contract for concrete bridge to Jos. Schickler.

Middlesex County, Ont.

The county council has awarded contract for bridge as follows: steel and concrete bridge, London Twp.—London Bridge Works Ltd., at $3,600; culvert $1,000, W. R. Waltham, Adelaide, Ont.

Matane, Que.

The contract for wharf and protection pile work to cost $69,000 has been awarded to Boulanger & Boulanger, Montmagny, Que.

Pointe-Au-Pic, Que.

Methot & Fournier, Montmagny, Que., have received the contract for repairs to wharf at a cost of $15,000.

Point aux Trembles, Que.

The contract for repairs to wharf to cost $6,500 has been awarded to O. & J Poliquin, Portneuf, Que.

Ste. Adele, Que.

The contract for steel bridge has been awarded to Alphonse Daris, Chateauguay, Que.

St. Guillaume, Que.

The municipal council has awarded Rosario Guertin, St. Duillaume D'Upton, the contract for reinforced concrete bridge to cost $3,489.

Residences

Essex, Ont.

Work is to start shortly on a $5,500 bungalow to be built on Cameron Ave. Frank Brown is the owner and general contractor.

Granby, Que.

Paul Choinierre is the owner and builder of a $4,500 residence on Franklin St.; 2 stories, 30 x 30, frame construction.

Hamilton, Ont.

S. R. Horsley, 85 Steven St., contemplates building a residence on Tragina Ave., and will let all trades.

Smith & Warburton are the owners and builders of 2 residences at Connaught and Cannon Sts. to cost $6,000; 1 story, brick construction.

James Ireland, 70 Belview Ave., is the owner and general contractor of a $7,000 residence being built on George St.; 2 stories, brick construction.

Standard Home Building Co. are the owners and builders of residences on Chestnut Ave. to cost $24,000; 2 stories, brick construction.

London, Ont.

Work is to start shortly on a $4,000 residence at 335 Tecumseh St.; 1½ stories, 24 x 28, red veneer construction. G. A. Nicholls, 167 Wortley Road is the owner and general contractor.

Work is to start shortly on 4 residences, $14,000, to be built on Pipe Line Road. H. R. Smith, 143 Wharncliffe Rd. S., is the owner and general contractor.

Montreal, Que.

N. Lamontagne, 1748 Cartier, is the owner and builder of 2 residences on Deserables St., to cost $16,000; 3 stories, 25 x 48, frame and brick construction.

F. Pepin, 1284 Mount Royal East, is the owner and builder of an $8,000 residence on St. Denis St.; 3 stories, 25 x50, frame and brick construction.

W. Bastien, 3626 Henri Julien is the owner and builder of 2 residences to cost $15,000 on St. Denis; 3 stories, 18 x 32, frame and brick construction.

J. H. Salisbury, 257 Walkely, is the owner and builder of an $8,500 residence on Walkely between Sherbrooke and Monkland; 2 stories, 30 x 45, frame and brick construction.

Mt. Dennis, Ont.

Work is to start at once on 5 bungalows, $3,000 each, Avon and Cayuga Aves.; 1 storey, frame and brick construction. W Southorn, 686 Shaw St., Toronto, is the owner and builder.

Ottawa, Ont.

B. J. Concliffe, 31 Simcoe St., is the owner and general contractor of a $4,500 residence being built on Warren Ave.; 2½ stories, 24 x 26, brick veneer construction.

Geo. Lett, 179 Cameron St., is the owner and general contractor of an $8,000 residence being built on Hopewell Ave. 3 stories, 50 x 38, brick veneer construction.

Point Grey, B. C.

Wm. J. Read, 2115-15th Ave., Vancouver, B. C., is the owner and builder of an $8,500 residence on Devonshire Crescent; 2 stories, 30 x 57, frame and stucco construction.

J. C. Seale is the owner and builder of a $5,000 residence on 29th Ave. W. 2 stories, 24 x 41, frame construction.

J. C. Neff, 3407-38th Ave. W., is the owner and builder of a $5,000 residence on 37th Ave. W.; 1½ stories, 24 x 42, frame construction.

Sandwich, Ont.

Albert H. Howe is the owner and general contractor of a $4,500 residence on Felix Ave.; 1½ stories, 20 x 24, frame construction.

St. Catharines, Ont.

H. N. Dockstater, 29 Brock St., is the owner and builder of a $4,000 residence at 35 Brock St.; 2 stories, frame construction.

Sarnia, Ont.

H. C. Robbins, 180 N. Forsythe St., is the owner of a $4,000 residence being built on South Christina St.

Sandwich, Ont.

Jas. Scott, 202 Sandwich St., is the owner and general contractor of a $4,000 residence on Sandwich St. 1 story, 24 x 26, frame construction.

Excavating has started for a $10,000 duplex residence on Partington Ave. E. J. Baby, 15 Park Place, is the owner and general contractor.

Toronto.

Jas. Bodie, 450 Pape Ave., is the owner and builder of 1 pair residences, $7,000, north side Sherwood Ave.; 2 stories, 32 x 36, brick construction.

Wm. Edmonds, 46 Glenholme Ave. is the owner and builder of 2 duplex residences on Robina Ave.; 2 stories, 25x40, brick construction. Tenders being received on painting, plastering, electric, plumbing and heating trades.

Work is to start at once on $10,500 residence and garage on Heathdale road for A. H. Adams, owner, 26 Balsam Ave.; 2½ stories, 25 x 36, tile and brick construction.

Stephen M. Styles, 19 Norman Ave., is the owner and builder of 1 pair residences on Ronan Ave.; 2 stories, brick construction.

The foundations are going in for a $7,500 residence west side May Ave., near Folkes St. 2 stories, brick construction. W. J. Crawford, 46 Armdale Ave., is the owner and builder.

Work is to start at once on 1 pair residences on Pinecrest Road; 2 stories, brick construction. Fred A. Smith, 153 Balsam Ave., is the owner and builder.

Jas. L. Bartram, 92 Lansdowne Ave., is the owner and builder of a $5,000 bungalow at 14 Grafton Ave.; 1 storey and basement, brick construction.

R. C. Sutherland, 717 Annette St., is the owner and builder of a $8,500 residence and garage, east side Durie St., near Annette.

The foundations are in for 1 pair residences, $6,000, at 111-113 Helendale Ave.; 2 stories, 32 x 36, brick construction. Dr. W. S. Grimshaw, 306 St. Clair West, is the owner and builder.

Excavation has started for 2 residences, $4,500 each, east side Colin Ave. near Trammer; 2 stories, 21 x 35, brick construction. Jas. A. Kitchen, 625 Lonsdale Ave., is the owner and builder.

Tenders are being received by Graham & Sibbett, general contractors, on plastering, electric, plumbing and tiling in connection with $18,000 residence and garage, north side Austin Terrace and Lyndhurst St.

Grimshaw Bros., 2033 Yonge St., are the builders of 4 residences, $7,000 each, corner Coxwell Ave. and Wolverleigh Blvd.; 2 stories, 21 x 35 each, brick construction.

A. H. Brownlee, 84 Monarch Park is the owner and builder of 3 residences, $5,000 each, east and west side Monarch Park Ave.; 2 stories, brick construction.

Robt. Roy, 40 Coady Ave. is the owner and builder of a $5,000 residence corner Monarch Park and Poulton Ave.; 2 stories, brick construction.

C. K. Rogers, Mimico Beach, Ont., is the owner and builder of a residence at 19-21 Lillian St., $5,000 each; 2 stories, 21 x 34, brick construction. Tenders are being received by the owner on interior trim.

Prices are wanted on the following trades in connection with 2 duplex residences to be built at 142-4 Howard Park Ave.; roofing, furnace, plumbing, interior trim, flooring and hardware. T. W. Robinson, 11 Evelyn Crescent, is the owner.

Wm. Pidgeon, 41 Nairn Ave., is the owner and builder of a $5,000 residence on north side St. Clements Ave.; 2 stories, brick construction.

The brick foundations are going in for 1 pair residences, $4,500 each, east side Priscilla Ave.; 2 stories, frame and brick construction. A. Allbridge, 47 Priscilla Ave., is the owner and builder.

Jno. Hambleton, 205 Yonge St., is the owner and builder of 3 residences on Melrose Ave. to cost $16,000; 2 stories, 21 x 35, brick construction.

Elliott & Gray, 63 Constance St., are the owners and builders of a duplex residence at 94 Woodside Ave.; 2 stories, 28 x 36, brick construction.

J. Gordon, 885 Broadview Ave., is the owner and builder of 1 pair residences, $4,500 each, west side Lesmount Ave. near Don Mills 2 stories, frame and brick construction

Jno. Thorne, 317 Woodbine Ave. contemplates building 1 pair residences, $9,000, at 672-4 Sammon Ave.; 2 stories, solid brick construction.

C. Gibbs, 11 Albermarle Ave., is the owner and builder of 1 pair residences south side Poulton Ave. near Woodbine Ave., to cost $8,000. 2 stories, shingle and brick construction.

Jackson & Mitchell, 853 Logan Ave., are the owners and builders of 1 pair residences, $8,000, at 7-9 Strathmore Blvd.; 2 stories, shingle and brick construction.

Day & Hill, 480 Strathmore Blvd., are the owners and builders of 1 pair residences $8,000, at 504-6 Strathmore Blvd.; 2 stories, 32 x 36, frame and brick construction.

The footings are going in for 2 residences at 107-9 Armdale Ave. Clayton Bros., 181 Garden Ave., are the owners and want prices on drains, concrete, flooring and hardware.

G. W. & Chas. J. Saunders, 126 Sherwood Ave., are the owners and builders of 1 pair residences, $6,000 each, on Sherwood Ave.; 2 stories, brick construction.

Basil P. Lake, 43 Stacey St., is the owner and builder of 2 residences on Brookdale Ave.; 2 stories, brick construction.

Victoria, B. C.

Tenders will be received by the Architect, Percy Fox, Victoria, B. C., no closing date set, for building a $5,000 residence; 1 story, frame construction.

Verdun, Que.

The framework is now going up for 6 flats being built on 2nd Ave. to cost $8,000; 3 stories, 30 x 40, frame and brick construction. A. St. Amand, 85 Rielle St., is the owner and builder.

Winnipeg, Man.

H. Hughes, 122 Hargrave St., is building a residence to cost $8,000 on Cordova Ave. Sheet metal, electric, plastering and painting trades will be let. The work is being done by day labor.

E. Russell, 249 Waverley St., Winnipeg, is building a residence to cost $10,000 on Westgate St. He will sub-let sheet metal, electric, plastering, painting and glazing trades.

Lowery Bros., 925 Main St., are the owners and general contractors of a $3,800 residence north side Atlantic Ave.; 1 story, 22 x 30, frame construction.

R. C. Mitchell, 370 Maplewood Ave., is the owner and builder of a $5,000 residence north side Florence, between Osborne and Hay; 1 story, 26 x 36, frame construction.

J. Finlay, 613 McIntyre Block, is the owner and general contractor of a $6,000 residence north west corner Sprague and Wolseley; 1 story, 26 x 34, frame construction.

J. H. Berry, 241 Scotia St., is the owner and builder of a $6,000 residence east side Brock, between Academy and Crescent; 2 stories, 24 x 26, frame construction.

Windsor, Ont.

W. Herridge is the owner and general contractor of a $4,000 residence on Pierre St.; 1 story, 24 x 38, brick construction.

H. S. Cowan is the owner and general contractor of a $4,000 residence on Bruce Ave.; 2 stories, 24 x 26, brick construction.

CONTRACTS AWARDED

Brantford, Ont.

A. Brock, 13 McLure Ave., is the general contractor for a $5,000 residence being built on Dundas St. for Dr. J. R. Calder. 1 story, 28 x 38, stucco and brick construction.

Baden, Ont.

C. L. Forter is the general contractor for a $6,000 residence being built for Dr. L. Harvey; masonry and plastering—J. Ruchl, New Hamburg, Ont.; electric—B. Lederman; plumbing and heating—N. M. Cressman; painting—J. Fisher, New Hamburg.

Burlington, Ont.

Kelly & Bray, Hamilton, Ont., have received the contract for electric work in connection with $25,000 residence being built for H. Alexander.

Dartmouth, N. S.

Smith & Whebby are the general contractors for a $4,000 residence being built on Thistle St. for Jos. Smith; 2½ stories, 35 x 38, frame construction.

Edmonton, Alta.

W. E. Morlidge, 10709-74th Ave., is the general contractor of a $2,500 residence being built at 9821 98th St. for Mrs. H. P. Mitchell. 1 story, 20 x 24, frame construction.

J. A. Dostalier, 117th St., is the general contractor for a $3,000 residence being built at 11129-98th St. for E. Cote. 1 story, 26 x 34, frame construction.

Ford, Ont.

Jos. Prince is the general contractor of a $4,000 residence on Pilette Road for Leopold Toile; 1 story 24 x 36, brick veneer construction.

Bateman & Tesch have the contract for plumbing and heating of $4,500 residence being built on Raymo Road.

J. Laforet, 325 Wyandotte St. E., has the contract for plumbing and heating of $3,500 residence being built on Drouillard Road.

Hamilton, Ont.

Goodram Bros. have the contract for plumbing and heating in connection with $18,000 apartments being built on Westinghouse Ave.

D. T. Cooper, 164 Avondale Ave., is the general contractor, and will sub-let trades, on $6,000 residence being built on Eastbourne Ave., for M. Reeves, 205 Rosslyn S.

Kitchener, Ont.

Thompson Winters has the contract for plumbing and heating of $7,000 residence being built for J. Waldschmidt.

London, Ont.

Chas. Thomas, Briscoe St., is the general contractor for a $4,000 residence being built on Tecumseh Ave. for W. E. Craig, 80 Byron Ave.; 1½ stories, 22x32, red brick veneer construction.

M. J. Morrison, 1333 Dundas St., London, is the general contractor for a $4,800 residence being built at 993 Lorne Ave. for J. R. Isaac; 2 stories, 22 x 30, red brick construction.

Moncton, N. B.

Moncton Plumbing & Supply Co., have the contract for electric and plumbing of $4,000 residence being built on Church St.

Montreal,, Que.

The following sub-trades have been let in connection with alterations to residence at 360 Peel St.; millwork—G. Roberts; roofing—Douglas Boos Co., Ltd.; electric—Vincent & Say; plumbing and heating—Gordon & Egan.

J. G. Wood, 352 Oxford Ave., is the general contractor for alterating residence to apartments at 508 Sherbrooke St. W. John Gordon, 301 St. Antoine, has the contract for plumbing and heating.

The following sub-trades have been let in connection with $8,000 residence being built near 1975 Bordeaux St.; roofing and plumbing—E. Lefrancois; plastering—N. Lapierre.

The following sub-trades have been let on $8,000 residence being built on Orleans St.; masonry—Mr. Martineau, Adam St.; electric—Romeo Noel; plumbing—Chouinard & Otis.

L. Beaudry, Papineau Ave., has the electrical contract, and Lapiere & Frere, 618 Fabre St., plastering work, in connection with $14,000 residence being built near 3300 St. Lawrence Blvd.

The following sub-trades have been let on $7,000 residence being built on Casgrain St.; electric—L. A. Bergeron; plumbing—Denis & Gagnon.

The following sub-trades have been let in connection with 2 residences to cost $16,000 being built on Connaught Ave.; roofing—W. Ouimet; electric—P. Houle; plumbing and heating—Jos. Charlebois.

The following sub-trades have been let on $12,000 semi-detached residence being built on Wolsey Ave.; roofing—Dominion Sheet Metal Co.; electric—A. E. Gregory; plastering—E. Nantel; painting—J. Price.

The following sub-trades have been let on 28 residences being built on Redpath between Sherbrooke & Pine Ave.; brickwork—J. Clement; electric—J. A. Roy; plumbing and heating—Conroy Bros.; plastering—A. Leger; tiling—Hamon & Hess.

North Bay, Ont.

John Somerville, 213 Fisher St., is the owner and general contractor of a $4,000 residence being built at Garr and Main Sts. Frank Miller has the contract for electrical work.

Oakville, Ont.

The following sub-trades have been let on $5,000 residence being built on Colborne St : masonry — Walter Beckley; electric—B. E. Sprowe; plumbing and heating—F. A. Mollisau; plastering—Harry Husband.

Thos. Shields is the builder of an $11,000 residence on First St. for E. Dean Wilkes; 2½ stories and basement, stucco construction.

Ottawa, Ont.

The following sub-trades have been let in connection with altering residence into apartments on Albert St.; plumbing and heating—Band & Cole; plastering—P. Beaupre; electric—W. A. Allen.

W. Green has the contract for plastering and McKinley & Northwood the plumbing contract in connection with $7,500 residence on Anglesea Square.

The following sub-trades have been let in connection with alterations and addition to residence on Somerset St., to cost $5,000; plumbing and heating—Gervin & Hodgins; plastering—Murphy & McMorrow; electric—H. Allen.

The contract for plumbing and heating has been let to A. Morgan, and plastering to J. Hobbs, in connection with $5,500 residence on Kenora St.

Sub-trades as follows have been let on $5,500 residence being built on Kenora St.: plumbing—H. Alexander; plastering—J. Hobbs; heating—A. L. Heath.

The following sub-trades have been let in connection with $5,000 residence being built on Nelson St.: plumbing and heat-

(Continued on page 57)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TENDERS

Thorold Public School

Bulk or separate tenders will be received by Mr. Frank M. Pew, Secretary Treasurer, c/o Nicholson & Macbeth, Architects, until five P. M.,

Monday, September 17th, 1923,

for all trades required in the erection and completion of an eight room school building for the Thorold Public School Board.

The lowest or any tender not necessarily accepted.

NICHOLSON & MACBETH, Architects,
46 Queen Street,
36-37 St. Catharines

TOWNSHIP OF HIBBERT

Tenders for Drains

Sealed tenders will be received up to 2 p. m.

Wednesday, Sept. 19th, 1923,

for the construction of the drainage work of what is known as the Bayfield River improvement, in the Township of Hibbert.

Plans, profile and specifications may be seen at the office of James Jordan, Clerk of Township, Dublin, Ontario, or at the office of John Rogers, Engineer of work, Mitchell, Ont.

Tenders must be accompanied by a marked cheque for 10% of contract.

The lowest or any tender not necessarily accepted.

JAMES JORDAN,
Township Clerk.
Dublin, P. O., Ontario,
August 28th, 1923. 36

TOWNSHIP OF MINTO

TENDERS for Municipal Drains

SEALED tenders will be received by the undersigned up to noon of

Monday, September 17th, 1923,

for the Construction of Municipal Drains Nos. 12, 16, & 17 in the Township of Minto, consisting of a total of 14542 cu. yds. of excavation in open ditch and 14280 lineal feet of Tile Drains.

Plans, Profile and Specifications may be seen at the office of the undersigned, Harriston, Ont.

An accepted cheque for 5% of the amount of the Contract will be required to accompany each tender and the successful tenderers will be required to furnish a Guaranty Bond for FIFTY per cent. of the amount of the Contract. The Township of Minto will pay the Premium.

Separate Tenders will be required in each Drain and on No. 17 separate Tenders for open ditch and Tile Drain.

The lowest or any tender not necessarily accepted.

W. D. McLellan,
35-36 Clerk of the Township of Minto,
Harriston, Ont.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Bridges

TOWNSHIP OF DOVER

Sealed tenders will be received by the undersigned up till noon on

Saturday September 15th,

for the construction of three steel pile trestle bridges (length overall about ninety feet) on the Little Bear Creek Drain in the Township of Dover.

Plans and specifications and form of tender may be seen at the office of the undersigned Chatham, Ontario.

Tenders must be accompanied by marked cheque for at least five per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
36-37 Engineer, Chatham Twp.

Sealed tenders addressed to the undersigned, and endorsed "Tender for breakwater extension at Port Arthur, Ont.," will be received at this office until **12 o'clock** noon (daylight saving),

Thursday, September 20, 1923,

for the construction of a section of rubble mound breakwater in the Main Harbour (North) at Port Arthur, District of Port Arthur and Kenora, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Custom-House Building, Fort William Ont.; Custom-House Building, Port Arthur, Ont.; Equity Building, Toronto, Ont., and Shaughnessy Building, Montreal, Que.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $50.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, August 27, 1923. 35-36

Tenders for Sewer Excavation

NIAGARA FALLS, ONT.

Tenders properly marked, will be received at the office of the City Clerk till noon,

Monday, September 17, 1923,

for approximately 2,900 lineal feet of trench from 6 to 9 feet deep by 4 feet wide. Payment to be made by the cubic yard. Particulars at office of City Manager.

T. S. SCOTT,
36-37 City Manager.

Department of Railways and Canals

Welland Canal

Storage Annex to Port Colborne Elevator

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Storage Annex to Port Colborne Elevator" will be received at this office until 12 o'clock noon on

Thursday, September 20, 1923,

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Welland Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained on payment of the sum of $50.00. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for a sum not less than ten per cent. (10%) of the Contractor's tender and made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
J. W. PUGSLEY,
Secretary.
Department of Railways and Canals,
Thursday, August 30, 1923. 36-37

FOR SALE

3 Drum Lidgerwood Hoist 65′ Boom. 8″ x 8″ Compressor and Motor on Trucks. 12 x 16 Crusher. 6 cu. ft. Gasoline Mixer. Also other equipment. J. G. Sipprell, Box 495, Halifax, N.S. 33-36

Construction accountant seeks position—ten years experience construction and industrial work. Available immediately. Box 361, Contract Record, Toronto, **34-37**

Canadian National Railways

Central Region Quebec District

Tenders for Railway Construction

Sealed tenders will be received at the office of the undersigned until twelve o'clock noon, Standard time, on the

Fifteenth Day of September, 1923,

for the construction of Donnacona Cut-Off between Donnacona on the Grand Mere Subdivision and Mile Sixteen on the LaTuque Subdivision in the Province of Quebec.

Forms of tender and instructions for tendering may be obtained at the office of the District Engineer, Champlain Market, Quebec, Division Engineer, Tunnel Terminal Station, Lagauchetiere Street, Montreal, and Division Engineer, corner of Sparks and Metcalfe Sts., Ottawa; and at the office of the undersigned.

Plans, specifications and forms of contract may be seen at the above offices or copies may be obtained by application to the undersigned on depositing a certified cheque on a chartered bank of Canada for Twenty-Five Dollars ($25.00) made payable to the Treasurer, Canadian National Railways, which will be refunded on return of plans.

Lowest or any tender not necessarily accepted.

F. L. C. BOND, Chief Engineer.
Canadian National Railways, Central Region,
Room 436, New Union Station, Toronto, Ont.
Toronto, August 27th, 1923. 36

For Sale

One 10 E. Austin Cube Mixer, traction wheels, in very good condition. Cash price reasonable. Chick Contracting Co. Ltd., Windsor, Ontario. 35-37

For Sale

One new Style "C" 18" x 33", centres Barber-Greene portable belt conveyor, mounted on one type F-5-18 semi-adjustable truck complete with one 3 H. P., 60 cycle, 200 volt AC motor complete. Lyons Fuel & Supply Company, Sault Ste Marie, Ont. 35-36

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

Natalite

Natalite is the name of a promising substitute for gasoline and is coming into actual use—in fact, is settled right down to business. It is a sugar-cane distillate made largely from waste material.

According to a report to the Department of Commerce, the South African Railways have just awarded The Natal By-Products, Ltd., the manufacturers of natalite, a six months' contract for the fuel for use throughout their motor-transport service. It will be supplied at 1s. 4d. per imperial gallon (26.7 cents for a United States gallon) free on board at Mearbank, near Durban. It is understood that this is about one-third under the lowest local bid for gasoline The producers of natalite claim that their product is 90 per cent efficient as compared with gasoline; and, even discounting this figure, it is likely to be further heard from in the near future.

Residences

(Continued from page 55)

ing — Mantha - Layace; plastering — C. Gravel; electric—L. Richard.

Outremont, Que.

Turcot Ltee., 1681 Clarke St., has the contract for roofing, plumbing and heating in connection with 2 cottages being built on Nelson St., to cost $17,000.

The brickwork is up one storey for $18,000 cottage on McCulloch. Sub-trades have been let as follows: plumbing and heating—A. Navert; plastering—Cusson & Lapierre.

Point Grey, B. C.

Arch. Rodgers Contracting Co., Vancouver, B. C., are the general contractors for an $8,500 residence on Marine Drive for Harry R. Bray, 510 Hastings St. West, Vancouver, B. C.

Quebec, Que.

J. B. Morin has the contract for roofing, electric, plumbing and heating in connection with $14,800 cottage on Grande Allee.

Riverside, Ont.

J. P. Jacques is the general contractor of a $5,000 residence to be built on Jefferson Ave. for Tancard Janisse.

Sandwich, Ont.

Bateman & Tesch have the contract for plumbing and heating in connection with $4,500 residence being built on Sunset Ave.

J. H. Jewel is the general contractor for a $4,000 residence on Baby Stretch, for John Regan; 1½ stories, 24 x 28, brick veneer construction.

St. Catharines, Ont.

The following sub-trades have been let on $4,500 residence being built at 26 Louisa St.: sheet metal, plumbing and heating—H. Oliver; electric—A. B. Cudney; plastering—Dakers & Swan.

Stratford, Ont.

J. Brandy has the contract for electric work, and F. Rodgers, plumbing and heating, in connection with $4,000 residence being built on Norman St.

Bennington Electrical Co., have the contract for electric work, and Ed. Cloney, for the painting and glazing, in connection with addition to residence for Nuns' home on Well St.

J. Commerford has the contract for plumbing and heating of $4,500 residence being built on Strachan Ave.

Toronto, Ont.

Moss & Stocks Electric Co., have the contract for electrical work in connection with $15,000 residence being built on Mt. Pleasant Road, near Blythwood Road.

The following sub-trades have been let on 1 pair residences being built at 30-2 St. Clair Gardens: plumbing—Geo. MacDonald; heating—W. C. Weeks; carpentry—Wm. Fugler. Tenders are being received on electric and plastering.

G. W. Minns, 380 Concord Ave., has the contract for plumbing, and R. Steen, 18 Frankish Ave., contract for heating in connection with $15,000 duplex residence being built east side Robina Ave. near St. Clair.

The foundations are in for a $7,000 residence corner Lacelles Blvd., near Hillsdale Ave.; 2 stories, 25 x 34, brick construction. H. E. McRobb, 55 Condor Ave., is the general contractor.

The following sub-trades have been let on $6,000 residence being built at 29 Manor Road; sheet metal—Crossley & Bridgewater; plumbing—I. Maude; heating—A Pountney; plastering—Hamilton & Jackson; painting—Wm. Prince.

W. S. Jury is the general contractor for a $10,500 residence and garage south side Milbank Ave., near Spadina Road; 2½ stories, 28 x 38, brick construction.

Thos. Frankish, 1 Walnut Ave., is the owner and builder of a $5,000 residence east side Coxwell near Glebeholme Ave. Arthur Bros., have the contract for carpenter work. Tenders being received by owner on plastering, plumbing, electric, painting and heating.

The following sub-trades have been let on $5,000 residence at 780 Coxwell Ave.: electric—N. McLeod; heating and plumbing—L. J. Harris; plastering—W. E. Page; painting, T. E. Davis.

W. J. Pearson, 198 Parkmount Road, is the builder of a $5,000 residence at 70 Poulton Ave. for Mrs. May C. Gemmell; 2 stories, 24 x 38, brick construction.

The following sub-trades have been let on $4,000 residence being built east side Coxwell Ave., near Milverton Blvd.: electric—N. McLeod; heating and plumbing—L. J. Harris; plastering—W. E. Page; painting—T. E. Davis.

S. J. Lane & Co. have the contract for painting, and J. Williams the plastering in connection with $20,000 residence being built on Oriole Parkway.

S. J. Lane & Co., 109 Bloor W., have the contract for painting in connection with $12,000 residence being built on Douglas Drive.

The following sub-trades have been let in connection with residence being built on Brookdale Ave.: electric—Clarke & Porter; plastering—J. Finch, Fairbank P.O., Ont.

S. J. Lane & Co. have the contract for painting of $12,000 residence being built on Oriole Parkway.

Major E. G. Switzer, 187 Blythewood road is the general contractor for a duplex residence being erected at 422 Annette St.; 2 stories, 26 x 35, brick construction.

Parkdale Concrete Co. are the builders of a $9,000 residence and garage south side Riverside Road, for P. Cole.

The following sub-trades have been let on 1 pair residences being built at 241-3 Glebemount Ave.: electric—Mr. Byford; plumbing, W. Hoad; heating—Howard Furnace Co.

Thomas Bros., 229 Glebemount Ave., are the owners and builders of 1 pair residences east side Glebemount Ave., near Sammon to cost $8,000. H. Sparrow, 73 Millbrook Crescent, has the contract for masonry work.

Jno. Thorne, 317 Woodbine Ave., is the owner and builder of 1 pair residences at 680-2 Sammon Ave., $8,000. Mr. Cannon, care of owner, has the contract for masonry work.

The following sub-trades have been let in connection with $20,000 residence being built on Oriole Parkway: painting—S. J. Lane & Co.; plastering—McClauskey & Feast.

Wm. B. Charlton, 12 Kendal Ave., is the general contractor for a $6,500 duplex residence at 99 Hocken Ave.; 2 stories, 24 x 36, brick construction.

Graham & Sibbett are the general contractors for an $18,000 residence and garage on north side Austin Terrace for A. E. McLean, 368 Bay St.

Verdun, Que.

H. Potvin, 816 Centre St., has the contract for roofing in connection with $7,000 residence being built on Church Ave.

The following sub-trades have been let on $9,000 residence being built on 1st Ave.: brickwork—A. Remy; roofing—Jos. Labelle; electric—E. Robillard; plumbing—C. Malchelosse; plastering—O. Legault; painting—A. Raymond.

The following sub-trades have been let in connection with residence (40 flats) being built at a cost of $125,000: masonry—J. B. Dalande; plumbing—J. Faubert; plastering—St. Louis & Brouille; painting and glazing—J. A. Raymond; roofing—A. D. Vinet.

The following sub-trades have been let in connection with $5,000 residence being built near Allen St.: brickwork—S. Marchessault; roofing—Jos. Labelle; electric—Mr. Dionne, Newmarch; plumbing—C. Malchelosse; plastering—W. Gauthier.

O. Prolux is the general contractor for 6 flats being erected on Ross St. at a cost of $9,000; 3 stories, 37½ x 45, frame and brick construction.

We Issue
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Fidelity Agency
of Canada Limited
Thirty Six Toronto Street

Westmount, Que.

The following sub-trades have been let in connection with $22,000 residence and garage, east side Grosvenor Avenue.: masonry—J. O. Heroux; plumbing—John Watson & Son; carpentry—C. J. Brown Ltd.

Weston, Ont.

E. R. Ramsay, 2 Lippincott St., Weston, has the contract for masonry work on $4,500 residence being built for B. Jackson, 9 Gray Ave., Mt. Dennis; 2 stories, shingle and brick construction.

Walkerville, Ont.

McDonald & Lawton are the general contractors for a $10,000 residence on Argyle Road being built for Dr. F. A. Millard, 492 Pelissier St ; 2 stories, brick veneer construction.

Windsor, Ont.

G. W. Raymes, 668 Gladstone Ave., Windsor, Ont , has the contract for plumbing and heating of $4,000 residence being built on Martin St.

Winnipeg, Man.

Lount Engineer Co., Ltd., are the general contractors for a $6,000 residence being built on Cordova St.; 1 storey, 30 x 40, frame and stucco construction.

Power Plants, Electricity and Telephones

Invermere, B. C.

The Provincial Department of Telegraphs and Telephones, Victoria, B. C., through the district superintendent, W. H. Stevens, Vancouver & Invermere, B. C., are receiving tenders until September 10 for a telephone exchange building estimated to cost $10,000. Plans and specifications are with the superintendent.

Leamington, Ont.

The Leamington Hydro Commission are having plans prepared for an ornamental lighting system to cost $6,000, at Talbot and Erie Sts.

North Temiskaming, Que.

Tenders are being received by Morrow & Beatty, general contractors, North Temiskaming, Que., for reinforced steel in connection with hydro power development. No closing date set.

Oshawa, Ont.

The foundations are in for a $5,000 power house being built for the Schofield Wollen Co., Ltd.; 1 storey, 44½ x 45, concrete and brick construction.

Pictou County, N. S.

Bulk or separate tenders are being received by A. T. Scott, secretary, Nova Scotia Power Commission, Halifax, N.S., till September 10 for the construction of a 66,000 volt single circuit transmission line from Hopewell to Stellarton, and a 13,200 volt transmission line from Stellarton to Pictou. Plans and specifications with secretary and resident engineer, Hopewell, N.S.

Selkirk, Man.

Tenders will be received by the Minister of Public Works, Winnipeg, Man., till September 12, for stoker for water tube boiler at power house, Hospital for Mental Diseases, Selkirk. Specifications and form of tender with the engineer of Municipal Services, Parliament Buildings, Winnipeg.

Timmins, Ont.

Hollinger Consolidated Gold Mines, Ltd., will build an electric terminal at Timmins. Specifications issued by Kerry & Chace, Limited, Toronto, Ont.

CONTRACTS AWARDED

Bagotville, Que.

The following contracts have been awarded in connection with hydro power plant equipment: wood stave pipe—Standard Wood Pipe Co., Williamsport, Pa.; turbine—S. Morgan Smith Co.; generator — Canadian General Electric Co.

Estevan, Sask.

The town council has awarded the following contracts in connection with electric lighting engine and generator to cost $22,000; engine—Skinner Engine Co., Erie, Pa.; generator—to be bought from Westinghouse Co.

Galt, Ont.

Webster & Trory have been awarded the contract for $5,000 boiler house to be built for C. Turnbull & Co., Ltd.; 1 storey, 45 x 60, brick construction.

Hamilton, Ont.

W. H. Yates Construction Co., Ltd., have received the general contract at $43,137, in connection with sub-station to be built corner Ottawa St. and Beach Road.

Hemmings Falls, Que.

Foundation Co., Ltd., Montreal, are the general contractors for power development for the Southern Canada Power Co.

Nelson, B. C.

Work has been commenced by the city on power line from Nelson to Balfour, B. C. D. Fraser and J. Hawkins have the general contract at $11,200. Contract for the transformers will be awarded this week.

Peterborough, Ont.

The walls are now going up for $50,-

WE WILL BOND YOU

Come to us for your contract bonds—promptness and service will meet you at every turn

Resources over - - - $31.790.000
Canadian Securities $ 2.247.500

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UNITED STATES FIDELITY & GUARANTY
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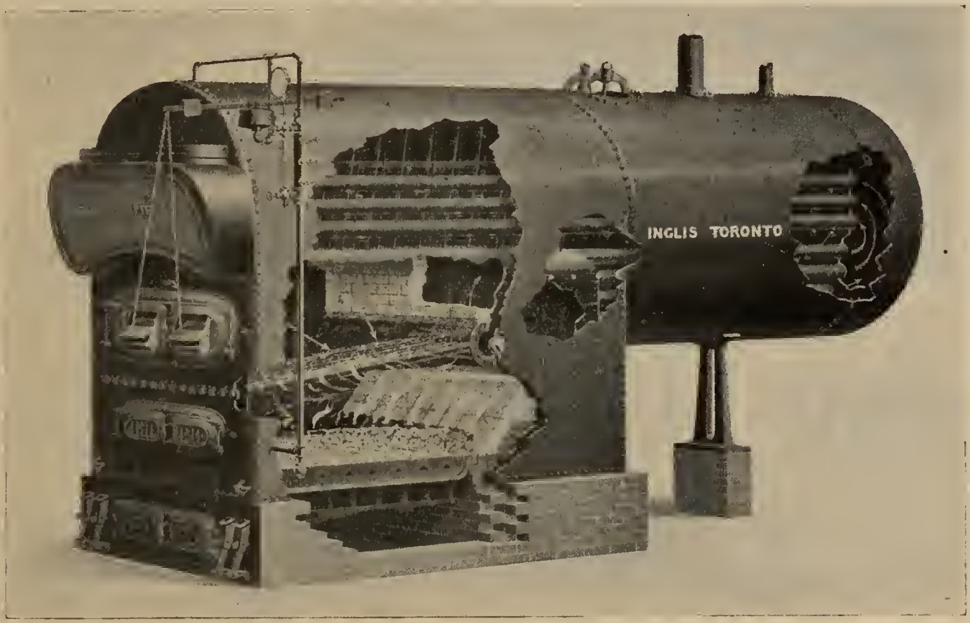
THE JOHN INGLIS CO.
LIMITED
ENGINEERS AND BOILERMAKERS
ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

TANKS, Stacks, Water Towers, and all classes of Steel Platework.

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First class workmanship—Best quality of materials—Prompt delivery
Write us for Prices, Catalogues, etc.

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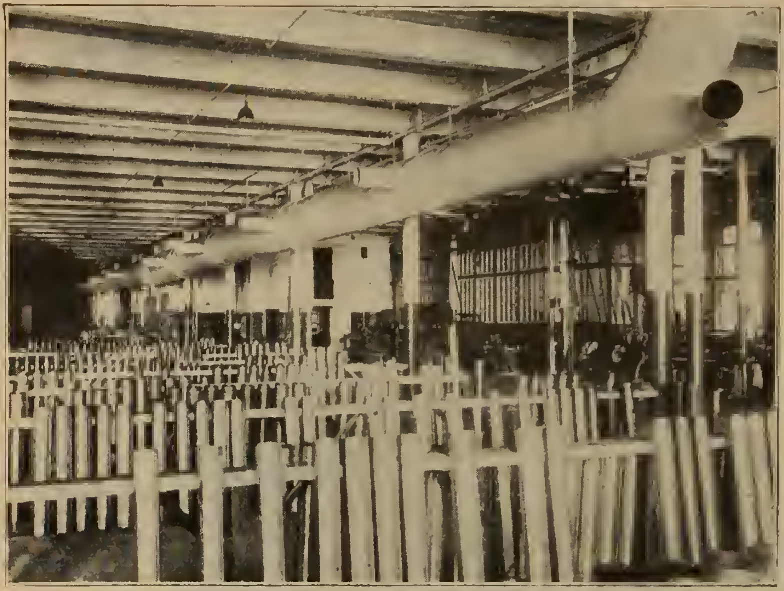


Human Efficiency

still depends upon pure air—human comfort and good health can't be had without it.

That is why Sturtevant Heating and Ventilating Systems do so much for the building trade generally—they so thoroughly insure the comfort and efficiency of the occupants of every building in which the System is installed.

Ask for Folder 606.

B. F. Sturtevant Company
of Canada, Ltd.

Montreal Winnipeg Galt Toronto

Sturtevant
PUTS AIR TO WORK

000 electrical distributing station. The following sub-trades have been let: cut stone and masonry—J. H. Sherwood; steel—Canadian Metal Window & Steel Products, Ltd.; roofing—Alex McLeod.

Unity, Sask.

The town council has awarded the contracts for telephone supplies as follows: Kipp, Kelly Ltd., Winnipeg, Man.; G. E. Junowsky and Thos. Frost, both of Unity, Sask.

Miscellaneous

Caribou Island, N. S.

Tenders are being received till September 14 by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., for reconstruction of breakwater. Plans and specifications at Dept. office of Dist Engineer, Halifax, N. S., and post office, Caribou Island, N. S.

Kitchener, Ont.

James, Proctor & Redfern, Ltd., consulting engineers, Toronto, Ont., have been engaged by the municipal council to make a report in connection with the grade revision and grade separation of the Canadian National line through this town.

Toronto, Ont.

The Canadian Foreign Products Ltd., have succeeded Macauley Pope, Ltd., 45 Jarvis St., Toronto, Ont., as the Canadian representatives for the "Marks poured-in-place Gypsum roofs and floors," and agents for the "Kernerator" incinerator for residences, etc.

CONTRACTS AWARDED

Curry's Cove, N. B.

The contract for dredging to cost $6,000 has been awarded to J. A. Gregory, St. John West.

Hamilton, Ont.

The contract for dredging at foot of Wellington St. has been awarded to the C. S. Boone Dredging & Construction Co., Toronto.

Point Traverse, Ont.

The contract for dredging to cost $13,000 has been awarded to the Frontenac Dredging Co., Ltd., Toronto.

Pictou Island, N. S.

Glasgow Dredging Co., Ltd., Queensport, N. S., have received the contract for dredging to cost $15,150.

St. Emelie, Que.

The National Dock and Dredging Corporation, Ltd., Levis, Que., have received the contract for dredging to cost $36,400.

Toronto, Ont.

The contract for repairs to breakwater to cost $30,000 has been awarded to Randolph MacDonald Co., Ltd., Crown Office Building, Toronto.

The contract for dredging eastern entrance of channel to cost $13,000 has been awarded to Jno. E. Russell, Harbor Building, Toronto.

Tiffin, Ont.

Wm. Bermingham, Kingston, Ont., has been awarded the contract for dredging, at $13,600.

Mitchells Bay, Ont.

The contract for dredging has been awarded to the Chatham Dredging Co., Chatham, Ont., at $9,800.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

Uniformity

Standard section tee rails are manufactured under the most exacting conditions. Every precaution is taken to insure a clean, solid steel and every step of the process is under the trained eye of experts. This same inherent quality is necessarily, therefore, a part of the reinforcing bars rolled from rails, augmented by the additional hot working of the steel from the rail to the reinforcing bar.

In 1912, Professor W. K. Hatt, of Purdue University, during his investigation of rail steel made under the direction of the American Society for Testing Materials, tested approximately three thousand samples of rail steel bars, representing the product of every rail mill in the country. The average elastic limit of the three thousand samples was 65,000 lbs. per square inch.

In 1917, Professor Talbot, of the University of Illinois, took samples of rail steel bars from the Western Newspaper Union Building which was being wrecked at that time. Tests on these bars showed an average elastic limit of 63,000 lbs. per square inch.

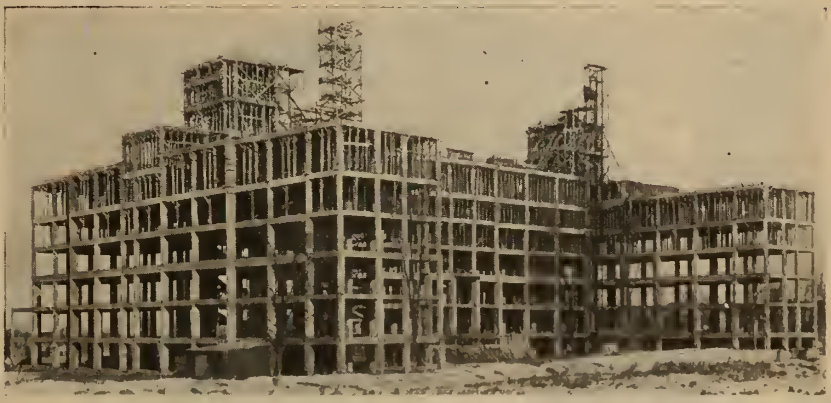
In 1921, one of America's largest inspection organizations was requested to review all of the tests that had been made on rail steel from 1912 to date. This review covered over five thousand tests and showed an average elastic limit of 64,200 lbs. per square inch.

Here, then, are three widely separated series of tests, both in time and location, which disclose a variation of only 2,000 lbs. in the average yield point. What better proof could be desired of the uniformity of strength of rail steel bars?

Specify your reinforcing steel to meet A.S.T.M. Specification A-16-14 or equal.

Send for This Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.



Ottawa Civic Hospital

Stevens & Lee, J. A. Ewart, Associate Architects
Harkness, Louden & Hertzberg, Engineers
Alex. I. Garvock, General Contractor.
450 tons Burlington Rail Steel Bars used.

We Get There First

Gillespie, Hart and Todd, Limited, of Vancouver, B.C., say: "Your reports enable us to solicit fire insurance in advance of our competitors, and to secure listings of properties for sale. For mortgage purposes we are placed in direct touch with persons requiring loans. We find your service invaluable."

MacLean Building Reports are the indicators that show when and where to go for business—the sign posts on the road to increased sales.

Write to-day for rates and sample reports. Learn more about our daily service for the increasing of sales in your line of business.

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Our new 16 page booklet "Getting Sales Facts First" sent on request.

No. W. 31079-A
1st. Rptd. 26-4-23

June 13th, 1923
PLANS BEING PREPARED
CHURCH HALL $30,000
VANCOUVER, B.C. (St. Mark's Anglican Church)

Owner—St. Mark's Church Board
Sup't.—Rev. A. H. Sovereign
2 stys; 50x80; conc. fndn; frame const; shg. rfg;
plmg; h. a. htg; fir & conc. flrg; fir int. trim;
elec. ltg;
INFORMATION BELOW NOT PREVIOUSLY REPORTED
Archs—Twizell & Twizell, 719 Metropolitan
Bldg., Vancouver, B.C.
Tenders will be called

Modern Oil Refinery an Industrial City

The modern oil refinery is a city of stills, agitators, sweat houses, power plants, machine shops, plant railroads, unloading racks, storage tanks, etc., all underlaid by innumerable pipe lines bringing the crude oil in some instances, from fields 1,500 miles distant It is distinguishable from afar by rows of towering smoke stacks rising from batteries of pressure stills.

There are today in the United States over 400 refineries, ranging from the small plant, which "skims" or "tops" the oil, to the complete refinery yielding the entire array of petroleum products. They represent an investment of $1,500,000,000.

Gasoline is shipped from the refineries in tank cars to bulk distributing stations at central points. In all, there are 133,000 tank cars in the petroleum service, representing an investment of $266,000,000. From the distributing stations, gasoline is carried by motor truck to tanks at filling stations, garages, and roadside pumps, whence it finally reaches the consumer.

Factories With Glass Sides

It is generally believed that the extensive use of glass in the roofs and sides of factory buildings, whilst obviously of great value in giving a well-illuminated and cheerful interior, has in bright and hot weather the disadvantage of making working conditions inside the building extremely oppressive. Whilst this may be true for a factory in which the ventilation arrangements are not highly efficient, some tests mentioned in the Chemical Trade Journal demonstrate that when efficient natural ventilation is provided the disadvantage does not exist. The results in question were obtained in a works which has probably a greater glass area in the roof and sides per unit of effective floor area than any other factory building in the world. The tests have proved that during the recent heat wave the average temperature inside the shops when working at normal speed was actually lower by several degrees than that in the shade outside. There is nothing remarkable in the nature of the glass, but particular care was taken that means were provided for an effective and purely natural circulation of air.

The Way the Wages Jumped

A short time ago the Statler people erected a new hotel in Buffalo, but apparently the construction was not without its own peculiar difficulties. Mr. E. S. Statler is quoted as saying:—"Our new Buffalo hotel has been building for two years, and I am glad that it is up. We began paying plasterers $8 a day on the job. They then demanded $10 a day, and we gave it to them; and then they followed this up by another two dollars, making $12 a day. The union restricted plasterers to a five-day week in Buffalo, but the men demanded work on Saturday. They got it, at double time for overtime. Then they demanded to be put to work Sunday. We put them to work, at double time for overtime. The plasterers got $48 for the two days' overtime, and earned $108 a week. Unskilled labor, which began at 30 cents an hour on the new hotel, is now receiving 75 cents—an increase of 150 per cent in two years."

Approved by the Ontario Provincial Board of Health—

JENKINS

SPECIAL TYPE F. M.

Swing Check

VALVES

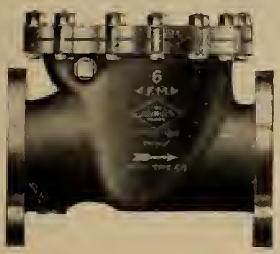

Fig. 481 FLANGED

For use for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.

Approved by the Ontario Provincial Board of Health and passed by the Factory Mutual Fire Insurance Companies Inspection Department these Swing Check Valves give that dependable service always to be found in Jenkins Diamond Marked Valves. Their design is such as to resist corrosion and disarrangement of parts. Equipped with a renewable disc of special composition, bronze hanger, seat ring and disc holder.

A Diagram showing correct installation of these Valves will be found on page 49 of Jenkins Catalog No. 9—free on request.

JENKINS BROS., LIMITED

Head Office and Works:
103 ST. REMI ST., MONTREAL
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European Branch:
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Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Works at Walkerville, Ontario

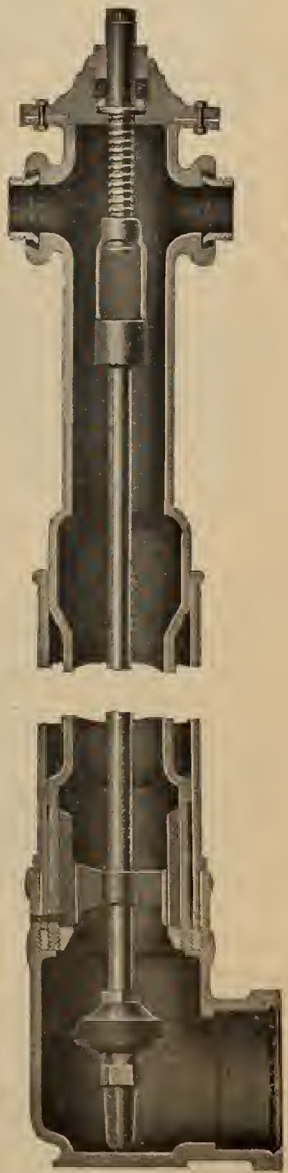
When placing your order for

HYDRANTS, VALVES and VALVE BOXES

place it with us.

MADE IN CANADA

Strong, Substantial and Modern Designs.
Prices right.
Write for prices and see.



THE KERR ENGINE CO. LIMITED
VALVE AND HYDRANT MANUFACTURERS
WALKERVILLE, ONT.

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.50 "	4.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.25	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.60	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 base	6.00 "	7.00 base	
Cast iron pipe	per ton	67.50 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50-6.00
Discounts		45 % truck lots	20 %		
		50 % car lots	50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
VITRIFIED CLAY PRODUCTS:—Discount on flue linings is 55%

Patching surface breaks on suburban highway with Tarvia

"Eternal Maintenance is the Price of Good Roads"

TODAY Road Engineers and well informed laymen realize that eternal maintenance is the price of good roads. For experience has conclusively demonstrated that *every* type of modern road or highway requires regular, systematic upkeep if it is to withstand the grinding wear of modern traffic.

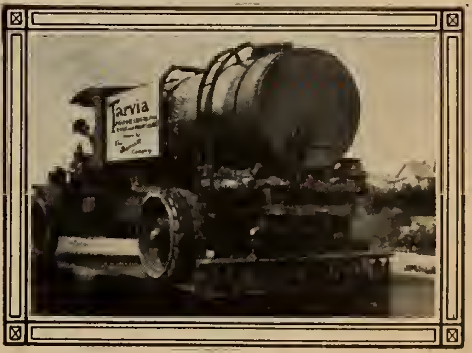
And every type of improved road can be satisfactorily and economically maintained with Tarvia. Hundreds of cities, towns, and rural communities throughout Canada, after experimenting with various methods and materials, today employ Tarvia maintenance on all their streets and highways.

Not only is Tarvia preeminent as a road-building material, but it is made in special grades that are unequalled for reconstructing, repairing and maintaining all types of improved roads—from gravel-surfaced country highways to city pavements. Tarvia keeps every type of good roads good, at minimum cost and with minimum interruption to traffic.

Send for "Road Maintenance with Tarvia"

If you are interested in economical maintenance for the roads of your community—if you want to keep down up-keep costs so that larger sums will be available for new road construction—send for "Road Maintenance with Tarvia." This is an interesting 56-page booklet containing 89 illustrations showing how Tarvia maintenance is applied to various kinds of road construction. Address "Tarvia Service Department" at our nearest branch.

Surface-treating with Tarvia and pea-gravel covering over brick pavement



Tarvia maintenance truck applying Tarvia

Patching macadam street with Tarvia

Tarvia
For Road Construction Repair and Maintenance

WINNIPEG VANCOUVER
HALIFAX, N. S.

The Barrett Company
LIMITED

MONTREAL TORONTO
ST. JOHN, N. B.

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.45	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

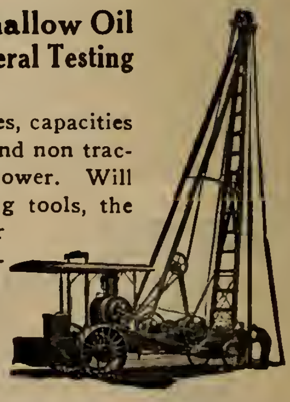
PLASTER *Including bags.

Cyclone Churn Drills

For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70.



The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.

Mussens Ltd Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver

You Should Certainly Have a Copy

This "Sales Inventory" of the Construction Equipment, Accessories and Supplies, which can be released from the Queenston - Chippawa Development, has been specially prepared solely as a service to—

CONTRACTORS
ENGINEERS
MINES
QUARRIES
MUNICIPALITIES
BRIDGE BUILDERS
BRICK COMPANIES
SAND AND GRAVEL COMPANIES
RAILROADS, ETC.

There is every possibility that you can save not only Money but valuable Time, by simply referring to this "Sales Inventory".

Your copy is available at our nearest office.

Also, our experience is at your disposal, if you have problems to solve. We have about everything imaginable in Construction Equipment and Supplies at extremely reasonable prices consistent upon the excellent condition.

LET US PROVE TO YOU JUST WHAT WE CAN DO.

Hydro Salvage Syndicate

P. O. Box 109, Niagara Falls, Ont.

Operated by

Canadian Equipment Co., Limited
Montreal

and

F. H. Hopkins & Co., Limited
Toronto and Montreal

Contractors–Engineers

Building Specialists and Manufacturers' Representatives

Patterson Electric Co.
Electrical Contractors
Northern Life Bldg., 615 Yonge St
Phone North 626 TORONTO

Specialties:
Electrical Construction,
Industrial & Commercial
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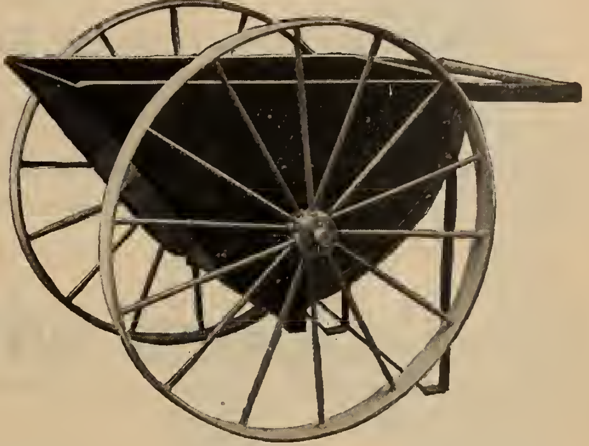

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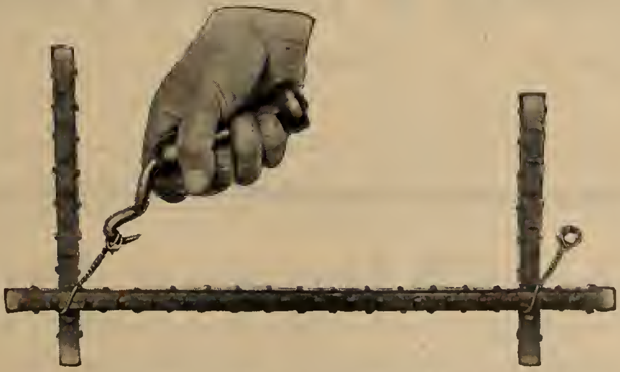

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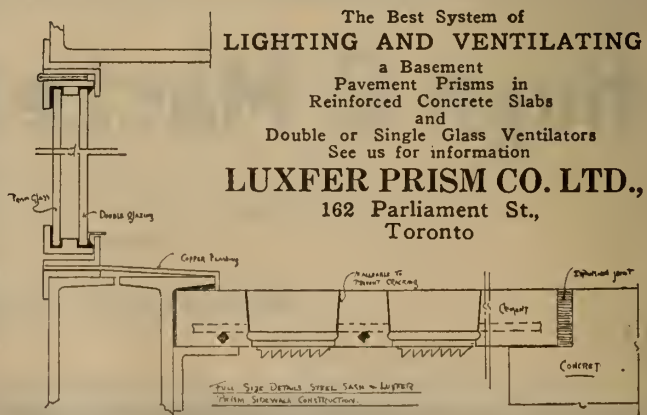

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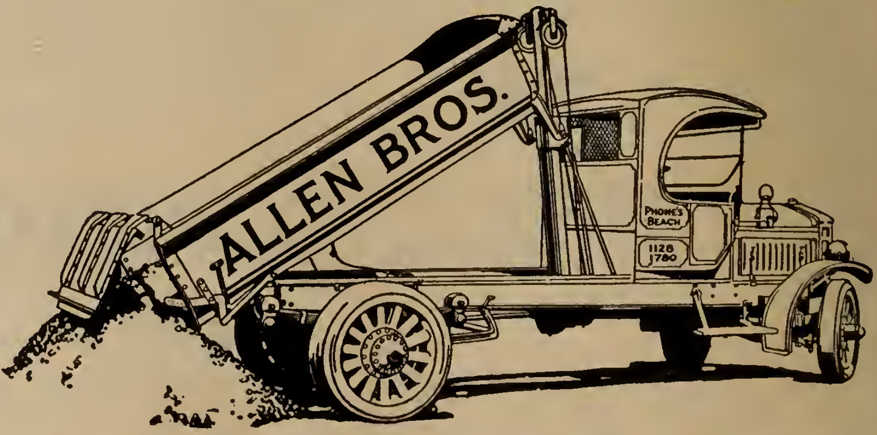

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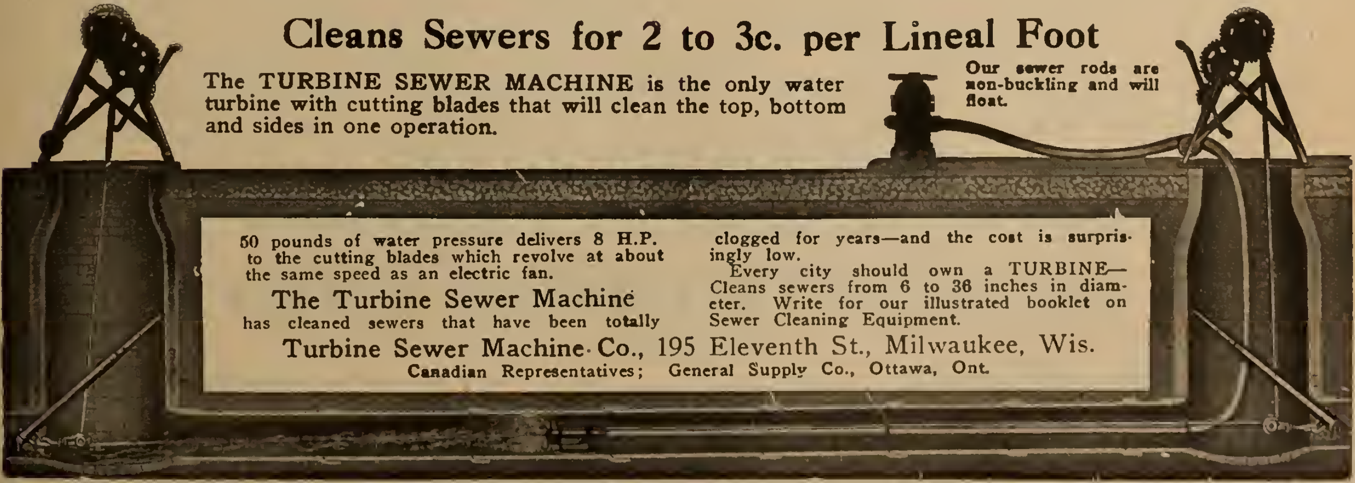
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Labelled under supervision of Underwriters Laboratories

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For All
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IRONWORKS

Limited

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Calumet 3697

DEPARTMENT OF LABOUR

BOILER INSPECTION NOTICE

Excerpt from Regulations for the Construction and Inspection of Boilers

Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

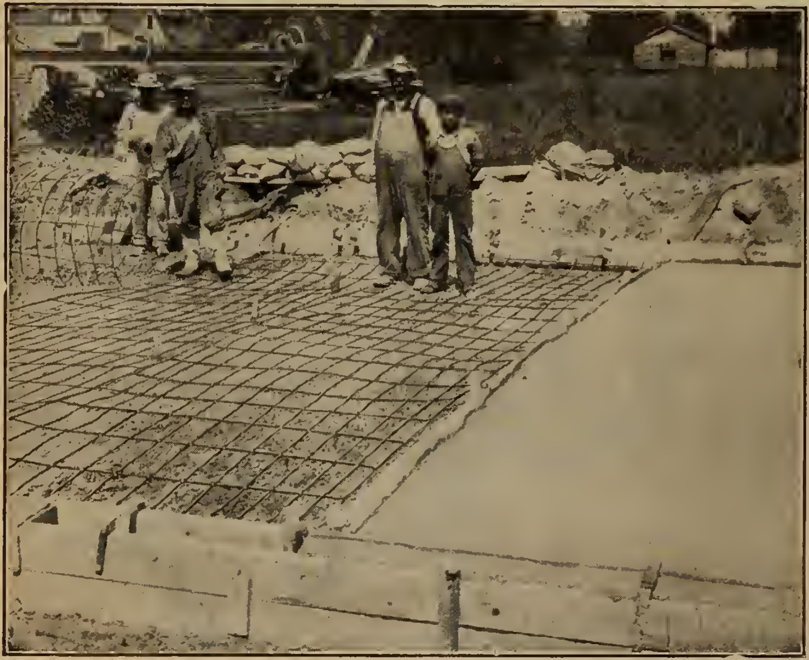
The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

HON. Dr. FORBES GODFREY,
Minister of Labour.

D. M. MEDCALF, Chief Inspector of Steam Boilers.

Reinforce Your Concrete Pavements and Roadways



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Galvanized Woven

STEEL

WIRE

MESH

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Gladly Sent on Request

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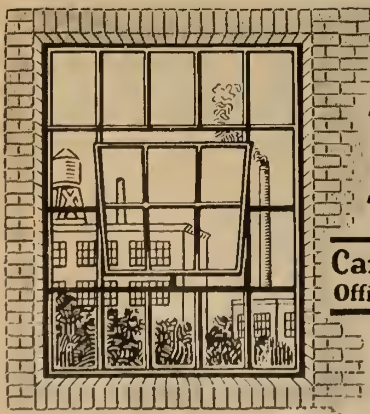
WINDSOR ONT.

Branches: Winnipeg, Man. Montreal, Que.



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STEEL WINDOWALLS

Fenestra

The name of the ORIGINAL steel WindoWall.

The symbol of superior QUALITY in material, patented design, workmanship and service.

Canadian Metal Window & Steel Products Limited

Office and Factory 160 River St., Toronto, Montreal Office 169 Peel St.

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R. R. Power, Royal Bank Chambers, Halifax, N.S.

Gandy & Allison, St. John, N.B.

W. J. Banks, 103 St. John St., Quebec.

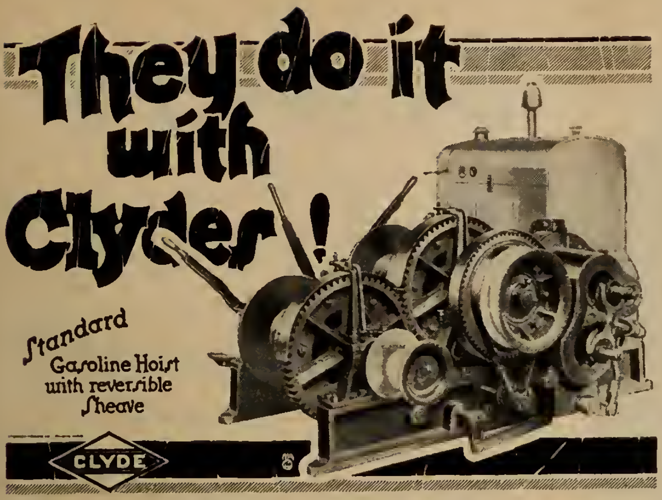
MacFarlane - Douglas Co., Ltd., 250 Slater Street, Ottawa.

R. Y. Kilvert & Co., 402 Builders' Exchange, Winnipeg.

A. L. Charlebois, Avenue J and 20th Street, Saskatoon.

Gormans, Limited, Edmonton and Calgary.

T. M. Grimbley & Co., 1158 Homer St., Vancouver.



W. F. Creighton, president Foster & Creighton Co., Nashville, says: "We are very pleased with the two Gasoline Hoists; they are a step forward in building-industry equipment. *** One of these has been operating a double cage brick hoist and a concrete tower at the same time. This has never been equalled by and other type of engine we have owned."

A multiple cylinder engine with silent belt chain drive—easily portable by truck and unusually economical of operation. Write for details.

You'll take pride in your CLYDE!

Clyde Iron Works Sales Company
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Sole Distributors for Clyde Iron Works

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The RIGHT CRANE *for* *the* RIGHT PURPOSE
Will Always Produce Results

O. S. DEPENDABLE Locomotive Cranes have reduced the cost of material handling to a minimum wherever installed. Manufactured in sizes from 7 to 60 tons capacity; mounted upon crawling tread, rail wheels or broad faced road wheels; steam, electric or gasoline driven; equipped with automatic devices for the economical handling of materials.

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Orton & Steinbrenner Co.
Main Offices: CHICAGO, ILL.
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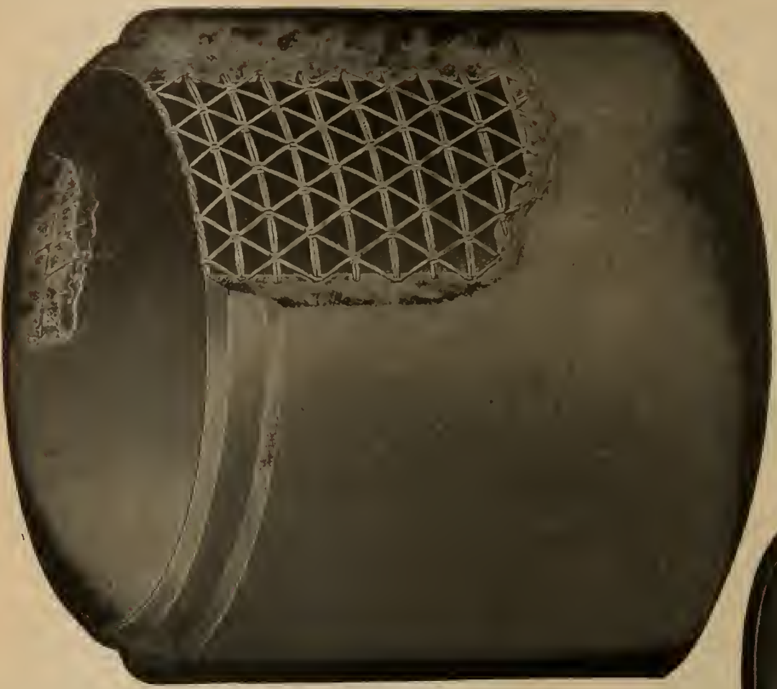
Canadian Representative,
Montreal - Toronto - Winnipeg - Vancouver.

MacKinnon engineers build oil storage tanks for a large Oil Company at St. Johns, Nfld.

The work in connection with these tanks was carried out to the entire satisfaction of all concerned, no delays being experienced and thus ensuring a minimum cost to the owners. The diameters of the tanks are 50 and 75 ft. respectively.

We are ready at all times to furnish estimates of any work similar to this, also bridges and buildings and steel plate work in general.

MacKINNON STEEL CO. LIMITED
Montreal Office: 404 New Birks Building, SHERBROOKE, QUE.



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and
Culverts
built from
Our Concrete
give maximum service
at minimum cost
(Large Stock on Hand)

Write us for Catalogue and Prices

Dominion Concrete Co. Limited
KEMPTVILLE - ONTARIO

This year
for
WATER MAINS
use
Made-in-Canada

P♔H Bell and Spigot Steel Pipe
Dipped and Wrapped

P♔H Bell and Spigot Steel Pipe

Sizes from 3 inches to 10 inches in Diameter

For complete information regarding the large saving in using and its many advantages over cast-iron pipe, communicate with

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Consulting and Inspecting Engineers
Chemists and Metallurgists.

Expert inspection and tests on all materials and equipment.

Parties having Relaying Rails, Cars, Locomotives and other used equipment for sale, are invited to list same with us, in view of various enquiries from clients for such information.

Head Office and Laboratories: McGill Bldg., Montreal.
Branches throughout Canada, United States and Europe.

Lumber at First Cost
Prompt Delivery

Any Quantity Rough Dimension, Timber—Square and Round, Rock Elm and White Oak Timber, White Pine, Hemlock and Spruce Lumber. All thicknesses. Can be dressed in transit.
Hardwood Lumber—all kinds, all thicknesses, all grades. In our Toronto yard.
Hardwood Flooring, grade Factory and Better.
Let us quote you prices.

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26 Queen St. East, Toronto Phone: Main 2806

We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
Harbours	**Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

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Head Office: Lumsden Bldg., Toronto

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LIMITED

MANUFACTURERS OF
Flexible and Flange Pipe
and Special Castings

Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
for Water, Gas, and Culvert

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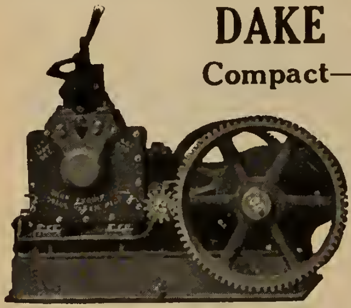
Compact—Simple—Reliable



Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience. Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

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Pacific Coast Pipe Co., Ltd.
Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter
Continuous Stave Pipe
from 16 in. to 12 ft. diameter
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Conduits
for Interior Construction

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Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

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Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
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300 Campbell Avenue, Toronto

CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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Faithful

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The safety of TURNBULL Freight Elevators is an important feature.

Each elevator is equipped, when so specified, with the TURNBULL Safety Gate which prevents accidents at the shaft door where 80 per cent of them happen.

The ideals of service which animate the whole Turnbull organization—integrity, faithfulness in trust, and honest service—are embodied in every Turnbull Freight or Passenger Elevator.

The result of these ideals combined with modern equipment and high-grade material is found in their ability to serve day in and day out without breakdown or delay. If interested, write for particulars.

The
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Hundreds of Satisfied Customers
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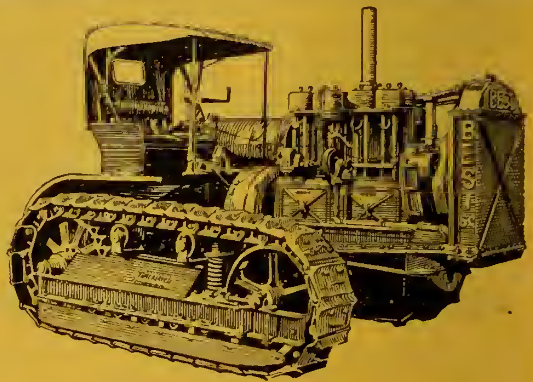
The "BEST":

A HEAVY DUTY ALL-PURPOSE

TRACTOR

for Contracting or Hauling Road Building, Logging, Farming, etc.



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Increase Capacity, Eliminate Vibration and Save Power

Materials and Workmanship of the Highest Grade

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Vol. 37 Toronto, September 12, 1923 No. 37

Contract Record and Engineering Review

Continuous Wood Stave Pipe

is economical

in first cost—
showing a lower cost per foot of line than any other standard form of construction;

in accessories—
simplifying anchorage problems;

in grading costs—
fitting naturally into inequalities of grade without specials, making possible the minimum of excavation;

hydraulically—
long radius curves and the smooth unbroken interior surface materially reduce friction losses.

Wire Wound Wood Stave Pipe
Steam Pipe Casing
Tanks Cable Conduit

Pacific Coast Pipe Company Limited
1551 Granville Street, Vancouver, B.C.

72" Continuous Stave Pipe Line at Anyox, B.C.

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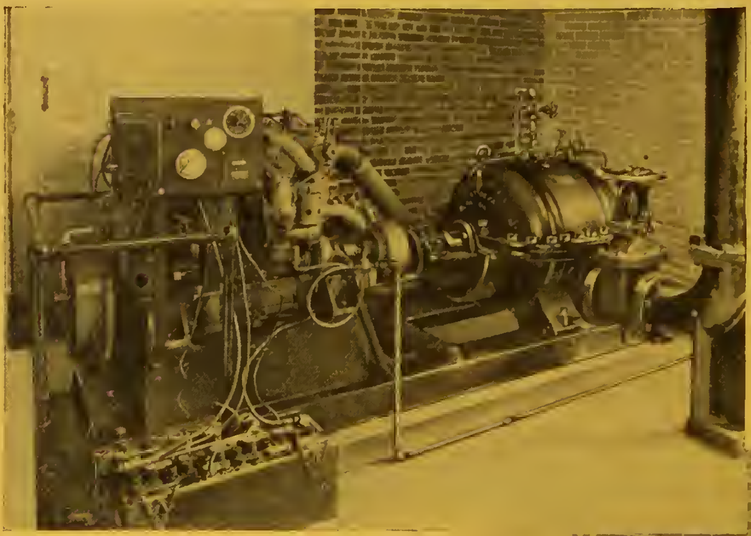
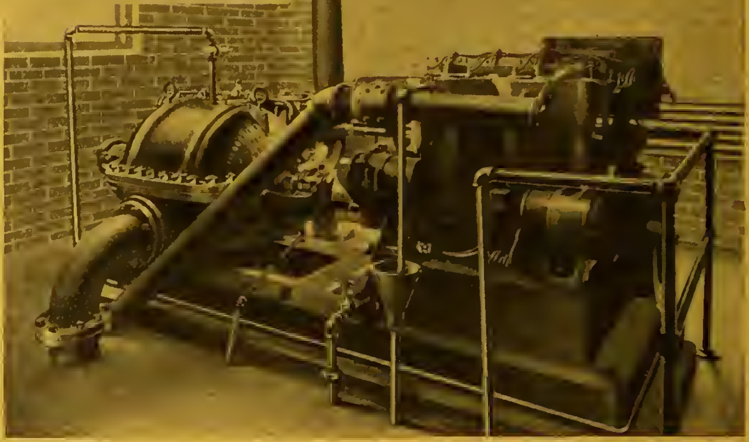


REES RoTURBo PUMPS

are positively self regulating, providing the maximum of high and sustained efficiency over a wide range of duties.



Showing two REES RoTURBo PUMPS, Gasoline Engine Driven at the Waterworks Pumping Station,

Preston, Ontario

Read what the chairman of their commission has to say regarding their efficiency.

PRESTON LIGHT & WATER COMMISSION, PRESTON, ONT.

Messrs. Goldie & McCulloch Co. Limited, June 5, 1922
Galt, Ontario.

Dear Sirs:

We are pleased to advise you that we have now had in operation for the past six months your Rees Roturbo Centrifugal Pumps, directly connected to gas engines, installed as auxiliary pumping equipment for fire pumps and domestic supply.

During this period of trial we have found them very efficient, entirely satisfactory in every detail and in every instance have been of great service to us in case of emergency. In fact, during the last two months owing to heavy ice storms and changes in our power plant we have had to rely solely on these for our water supply and have found their service satisfactory. Over and above this we have made a saving in our fuel bill of about $1,800.00 per annum and hope to be able to receive a reduction in the insurance rates in this municipality for this extra protection.

Yours truly,
P. R. Hilborn,
Chairman, Preston Light & Water Commission.

Our Catalog and the advice of our pump experts are yours for the asking

THE GOLDIE & McCULLOCH
COMPANY, LIMITED
GALT - ONTARIO - CANADA

Toronto Office: Suite 1101-2 Bank of Hamilton Bldg., **Western Branch: 248 McDermott Ave., Winnipeg, Man.** **Quebec Agents:** Ross & Greig, 400 St. James St., Montreal, Que. **British Coumbia Agents:** Robert Hamilton & Co., Vancouver, B. C. **B. C. Safe Agent:** C. L. Ford, 569 Richards St., Vancouver, B. C. **Maritime Safe Agent:** E. L. Stailing, Roy Bldg., Halifax, N. S.

IDEAL CONCRETE BLOCK MACHINES THE WORLD'S STANDARD

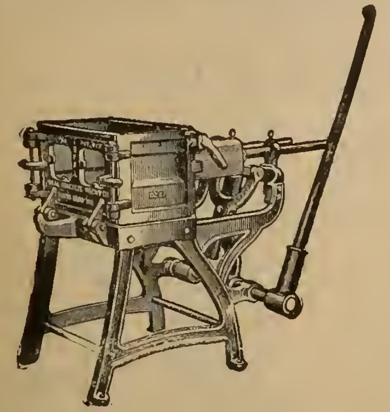


Fig. 910

The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.

The Ideal Block Machine makes every style of block required.

—Fully described in Catalogue No. 22-B-1

Concrete Blocks, Brick and Culvert and Sewer Tile

are a staple article. Thousands of contractors who operate their own plants have found this the most profitable branch of their business. It provides work for their men during winter months and will provide a source of income the year around.

The Ideal Concrete Block stands supreme the world over. They are made in any size, shape or design to suit the most exacting Architect or Engineer. One of the most recent developments is that of making blocks to receive stucco finish, which is very popular in house construction.

LONDON CEMENT BRICK MACHINE
Hand Power

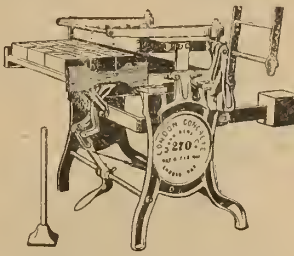
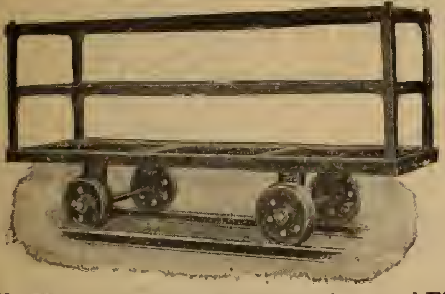


Fig. 91

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression. This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.



We Make a Full Line of Brick, Block and Tile Cars. Prices on Application

—Fully described in Bulletin No. 17

Cement Brick are in good demand in many localities where building materials are required. They are suitable for all classes of construction and can be profitably made without a large expenditure.

LONDON CULVERT TILE AND SEWER-PIPE MOULDS

Made in all Sizes From 4 in. to 72 in.

Our moulds are made on designs approved by Engineers. There are large profits in making Culvert Tile and Sewer Pipe.

—Described in Bulletin P-1.

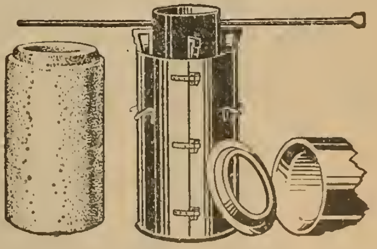


Fig. 95.

London Tile and Sewer Pipe Moulds have been used to make concrete tile for every large Municipal Sewer contract in Canada within recent years. They make tile in all sizes from 4 inches up to 10 feet in diameter.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7, London, Canada

World's Largest Manufacturers of Concrete Machinery

Sales Offices and Warehouses:

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Rene Talbot, Quebec, Que.
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McCRACKEN SEWER PIPE
Is Winning Canada's Favor

Mr. J. R. Stewart, Town Engineer of Renfrew, Ont., says:

I may state that we have been using concrete pipe in sewers and storm drains for a number of years. Last year we laid down over 8,000 feet of concrete sewer pipe and it is giving satisfactory results.

I have in mind a piece of sewer which I built about 20 years ago, when I first became engineer for the Town of Renfrew. This sewer seems to be in as good condition today as when first constructed and we never had trouble with it. As far as I am concerned I would prefer concrete tile, as I find there is not near the loss in breakage as there is in the vitrified tile, and there is not the same trouble in laying pipe, as every pipe is true to shape.

Very truly yours,
(Sgd.) J. R. STEWART,
Town Engineer.

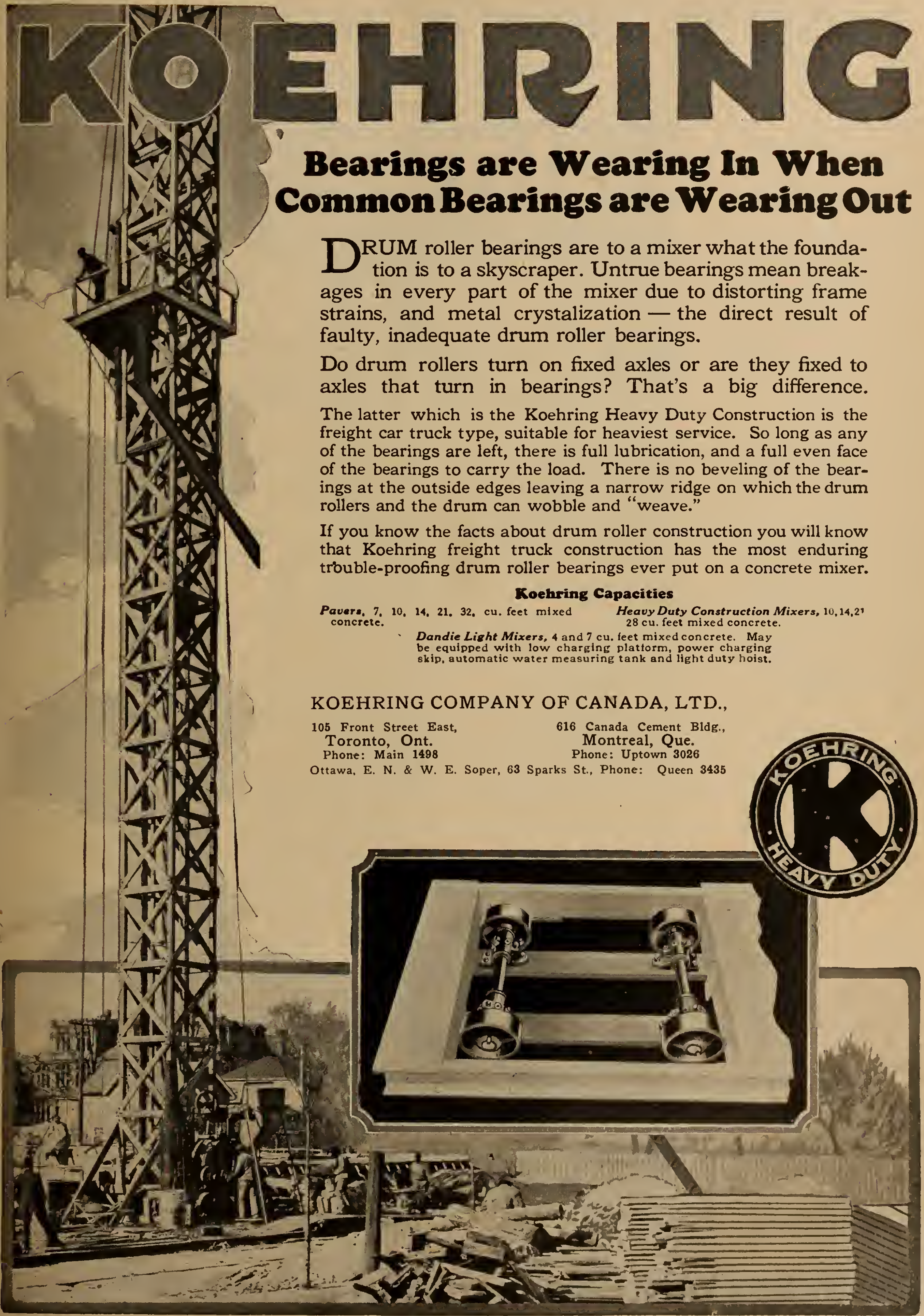
Results are, after all, the safest guide to Sewer Pipe quality. You know McCracken Sewer Pipe is sound in principle because it is manufactured in accordance with standard specifications issued by the American Society for Testing Materials for Cement Concrete Sewer Pipe—every pipe is of the same uniform high quality. It is inspected by the Canadian Inspection and Testing Company, Limited.

Write for complete information and quotations

JNO. E. RUSSELL COMPANY LIMITED
GENERAL SALES AGENTS
HARBOR ADMINISTRATION BUILDING, TORONTO

McCRACKEN SEWER PIPE

"The Pipe That Endures"



KOEHRING

Bearings are Wearing In When Common Bearings are Wearing Out

DRUM roller bearings are to a mixer what the foundation is to a skyscraper. Untrue bearings mean breakages in every part of the mixer due to distorting frame strains, and metal crystalization — the direct result of faulty, inadequate drum roller bearings.

Do drum rollers turn on fixed axles or are they fixed to axles that turn in bearings? That's a big difference.

The latter which is the Koehring Heavy Duty Construction is the freight car truck type, suitable for heaviest service. So long as any of the bearings are left, there is full lubrication, and a full even face of the bearings to carry the load. There is no beveling of the bearings at the outside edges leaving a narrow ridge on which the drum rollers and the drum can wobble and "weave."

If you know the facts about drum roller construction you will know that Koehring freight truck construction has the most enduring trouble-proofing drum roller bearings ever put on a concrete mixer.

Koehring Capacities

Pavers, 7, 10, 14, 21, 32, cu. feet mixed concrete.

Heavy Duty Construction Mixers, 10,14,21 28 cu. feet mixed concrete.

Dandie Light Mixers, 4 and 7 cu. feet mixed concrete. May be equipped with low charging platform, power charging skip, automatic water measuring tank and light duty hoist.

KOEHRING COMPANY OF CANADA, LTD.,

105 Front Street East,
Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Que.
Phone: Uptown 3026

Ottawa, E. N. & W. E. Soper, 63 Sparks St., Phone: Queen 3435

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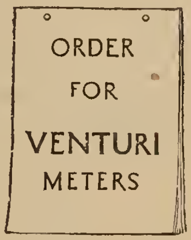

The question of increasing the supply of water is one which confronts the management of every Water Works System, sooner or later. The correct decision of this question is of great importance to the entire community served. Before making a recommendation for expensive dams, reservoirs, pumping equipment, etc., serious consideration should be given to greater efficiency in operating the existing system.

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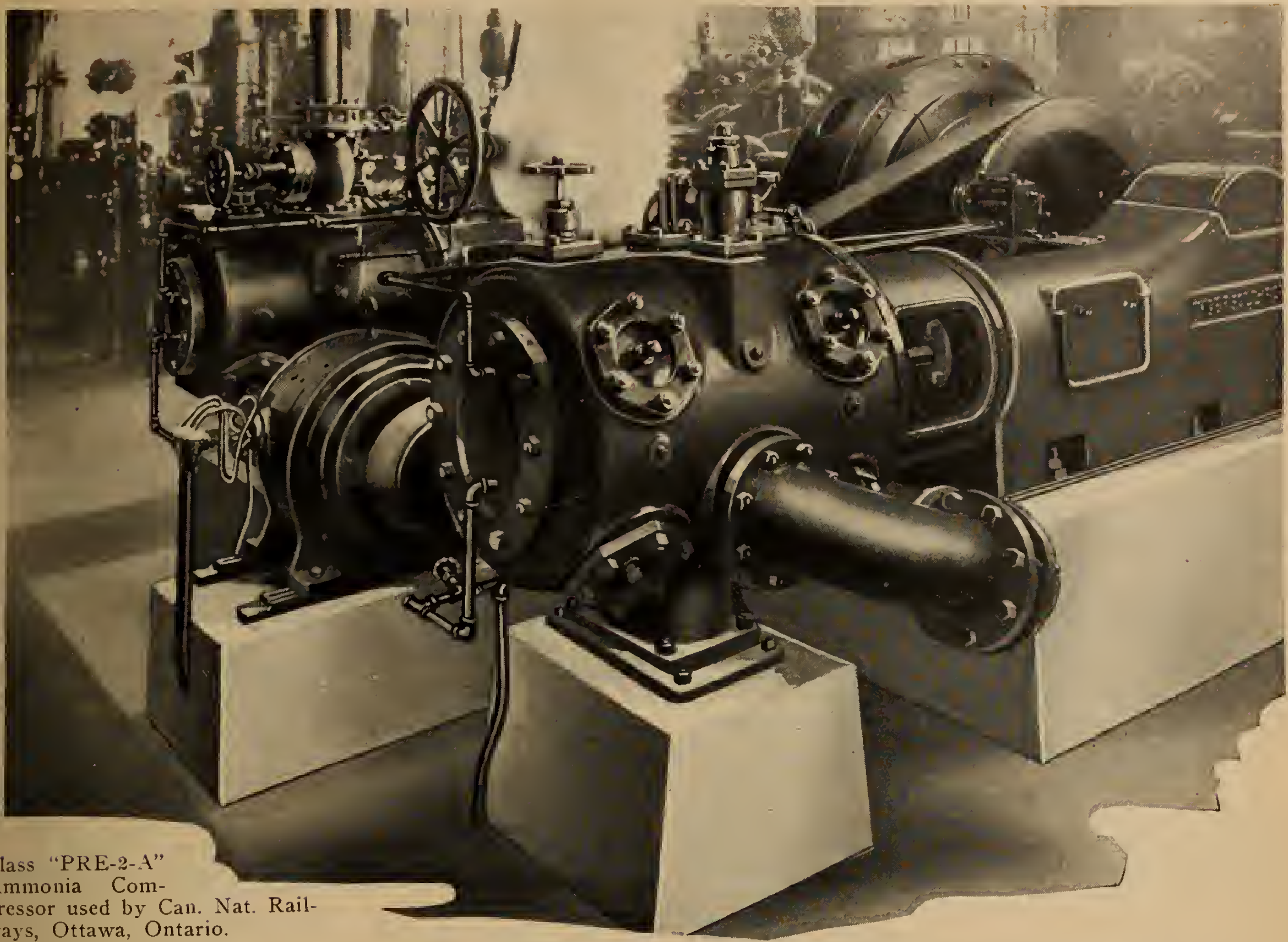

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Supplying materials for the type of house shown above is an extremely profitable proposition. And the dealer who handles Gypsum products finds it a comparatively easy one. For the Gypsum dealer is able to prove the superiority of his materials over any others on the market. Take Gyproc Wall Board for instance:

IT IS THE ONLY FIREPROOF WALL BOARD ON THE MARKET

And when you have the fire underwriters, fire department officials, home owners, builders, architects, and others urging the adoption of Gyproc, sales resistance is reduced to the minimum.

ACT NOW!

Dealers all over the country are rapidly taking up the Gyproc agency. The time for you to act is now. With every month's delay, you are sacrificing business and profits. Why not drop us a line today?

Gypsum Products:

- Gyproc Wall Board
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Each Year Sees an Increase in Canada's Concrete Paving Yardage

The revolution in road traffic, due to the automobile and the heavy laden truck has created a positive use for permanent, skid-proof, fuel saving highways of Concrete. Governments, Municipal and Provincial, have come to this realization.

Permanent highways of Concrete pay for themselves. They lessen the taxpayer's burden by reducing upkeep to a minimum. They lower haulage costs, attract tourists and promote the comfort and well-being of every community they serve.

Evidence of the increasing popularity of Concrete is found in the following figures of total yardage year by year in Canada.

Concrete Paving Completed in Canada

Square Yards laid each year and total yardage year by year

	Year	Western Provinces	New Brunswick Nova Scotia	Ontario and Quebec	Total
Prior to	1912	197,083	......	145,101	342,184
During	1912	45,794	......	168,374	214,168
"	1913	146,421	1,190	321,389	469,000
"	1914	90,520	10,670	449,125	550,315
"	1915	37,480	17,439	627,495	682,414
"	1916	52,010	9,742	446,998	508,750
"	1917	......	16,740	432,530	449,270
"	1918	......	......	131,118	131,118
"	1919	10,560	4,500	608,180	623,240
"	1920	95,624	8,000	660,044	763,668
"	1921	55,711	11,734	1,237,878	1,305,323
"	1922	74,465		1,549,468	1,628,933
Total end	of 1922	805,668	80,015	6,777,700	7,663,383

"It's the little they cost to maintain that makes Concrete Pavements Economical

Specify
CANADA CEMENT
Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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CONCRETE
FOR PERMANENCE

CANADA CEMENT COMPANY LIMITED
Canada Cement Company Building
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Sales Offices at: Montreal Toronto Winnipeg Calgary

MUSSENS M LIMITED

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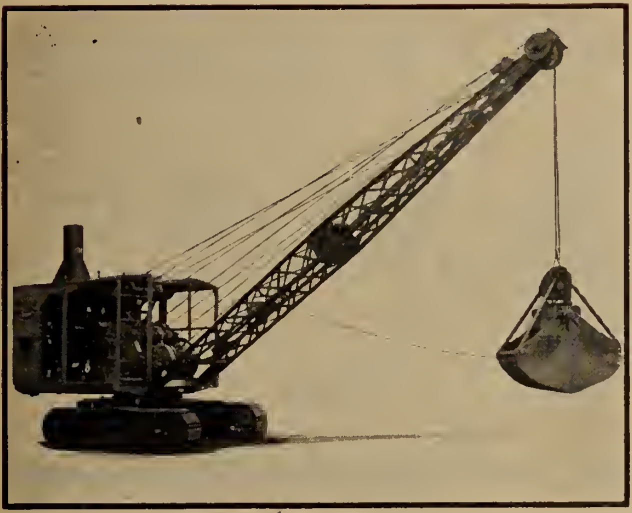

Half-circle
and
Full Revolve

2½ Tons - 5 Tons - 10 Tons

**Gas, Steam or Electric Power
Road Wheels, Car Wheels or
Caterpillars**

BYERS "TRUCKRANE"

**ready for mounting on your
own used truck**

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**We are headquarters for all classes of
material handling equipment.**

MUSSENS LIMITED

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MUSSENS M LIMITED

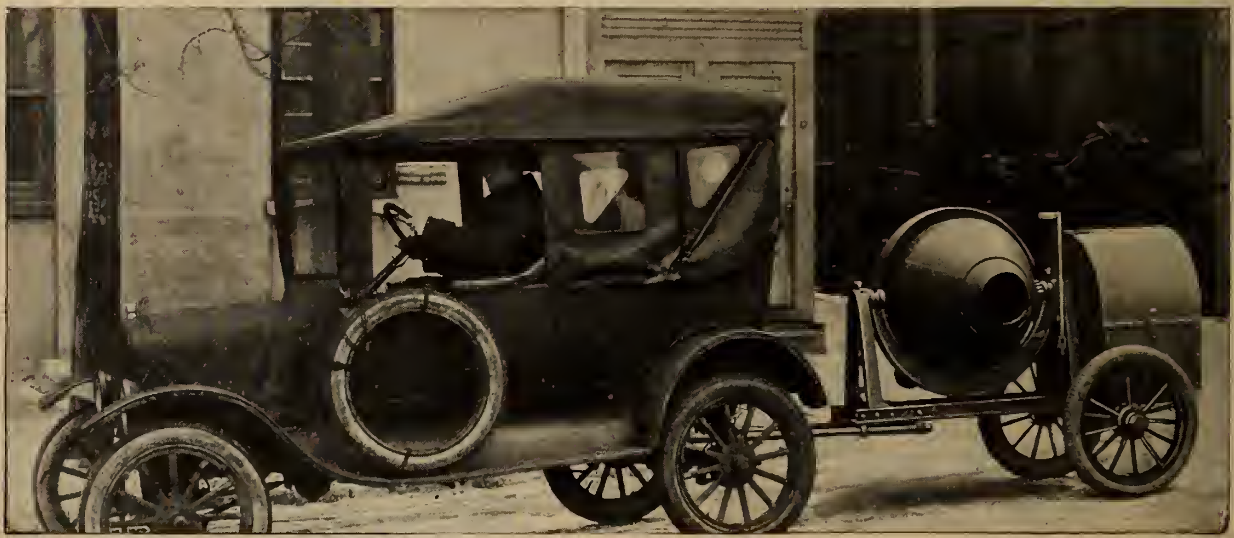
Another SMITH Triumph

The same careful design and the same high quality of materials have produced the

SMITH 4 S MIXER

Full Half Bag Batch

Fills a long-felt want for the smaller work



Furnished on 2 wheels as shown or on 4 wheels

Speed and Durability are well known qualities of SMITH MIXERS, whether it is a 4 foot machine or a 4 yard outfit.

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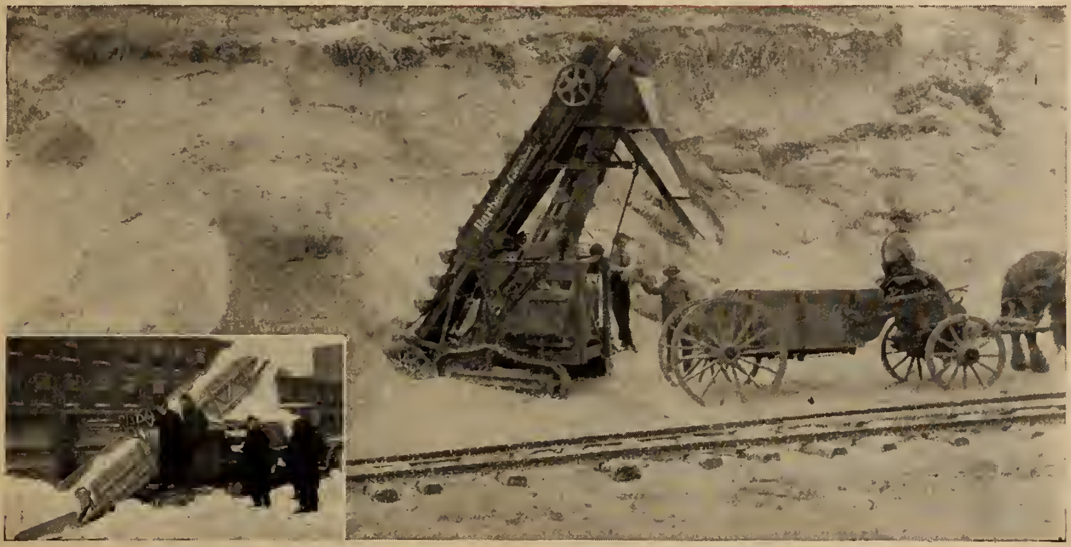

A Barber-Greene Snow Loader converted into a Bucket Loader and handling gravel

Gravel in Summer — Snow in Winter

How a Barber-Greene and 2 men replace a gravel-loading gang in summer — and 60 men in winter

IN Worcester, Mass., the street railway company decided to solve the snow removal problem with a Barber-Greene Snow Loader—just as many municipalities have solved it.

In this class of work the Barber-Greene saves 60 shovel men in some cities—and according to officials of the Boston "L" as many as 200 under certain conditions.

To put the Barber-Greene to work in summer also the Worcester company changed it into a Barber-Greene Bucket Loader—by replacing the snow-loading boom with the bucket-loading boom.

Like other street railway companies and many municipalities, they have found that in loading gravel for construction work the converted Barber-Greene replaces a gang with one man.

They have also found the Barber-Greene useful in other ways. For instance, when the track shown in the photograph reproduced above was too far away from the bank, the Barber-Greene was used to pull the entire track closer to the pit. No track gang at all was required to help the loader operator and his helper in this work.

The present high cost and scarcity of labor are influencing more and more municipalities to solve the winter snow and the summer construction problem at one stroke by putting a Barber-Greene to work.

Its automatic disc-shoveling device is so effective that it handles stone, gravel, and similar construction materials without even requiring shovelers for the clean-up work.

It is converted into a Snow Loader by replacing the bucket-loading boom with a snow-loading boom.

Its success is due to its design and to the fact that it is the product of a company that has for years specialized in material handling equipment.

Details about its construction performance are freely furnished upon request.

Ask our nearest office for particulars

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This is an unretouched photo of two link-pins which were taken from a caterpillar type Erie after more than 250 miles of travel.

There is less than ten one-thousandths of an inch wear, due to complete lubrication of the mounting—the link-pins and rollers being oiled automatically from internal reservoirs.

These pins are tempered spring steel. and turn in tempered spring steel bushes. **Wear at the bearing after long service cannot ruin an Erie link.**

This is one of three Erie Shovels owned by Latimer & Maloney, Washington, D. C. They write: "We do not hesitate to recommend the Erie in preference to any other make of shovel."

It will pay you to use the caterpillar type shovel with *lubricated* link-pins and rollers.

Lubrication

protected these link-pins for 250 miles of travel

There is almost no wear at all on these two pins, which were taken from a caterpillar type Erie owned by Latimer & Maloney, Washington, D. C., **after more than 250 miles of travel.**

Exact measurement shows that the average wear on these pins, over all, is ONLY TEN ONE-THOUSANDTHS OF AN INCH.

It is hardly necessary to mention what would have happened to these pins if they had been run dry, with one steel surface grinding against another. As any owner of a continuous tread shovel knows, link-pins that run without oil are chewed to pieces long before 250 miles of travel—or anything like it.

The Erie's link-pins are tempered spring steel, and the pin bearings have tempered spring steel bushings. It is never necessary to replace an entire link because of a worn bearing.

Any contractor who knows the facts will make the right choice

The economy of **complete lubrication** has been proved on more than 750 caterpillar type Eries. Repair costs on these mountings have been little or nothing.

The same designing brains that produced this better mounting have also worked out every other detail of Erie Shovels and Cranes. Actual repair records show that Eries cost only ⅓ as much to keep up—**and make the same saving in working time.**

We will be glad to send you photos and data, showing just what Eries can do on any kind of shovel or crane work. Write and tell us what class of work you have in hand.

ERIE STEAM SHOVEL CO., ERIE PA., U. S. A.

Incorporated 1883; formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

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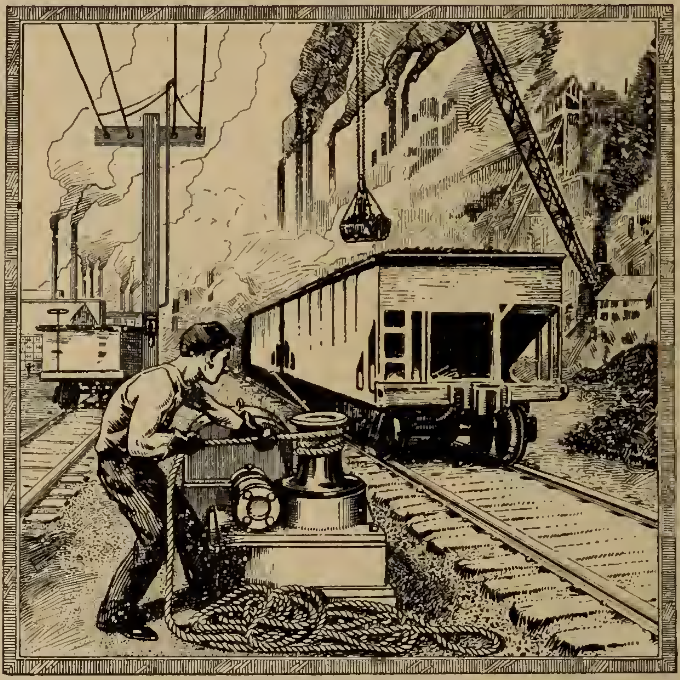
CANADIAN MM Co **MEAD-MORRISON** CANADIAN MM Co

CAR PULLER



Two sizes in stock—7,500 lb. or 10,000 lb. rope pull.

Don't wait for, and be dependent on, the switching locomotive. Move your cars with one man.

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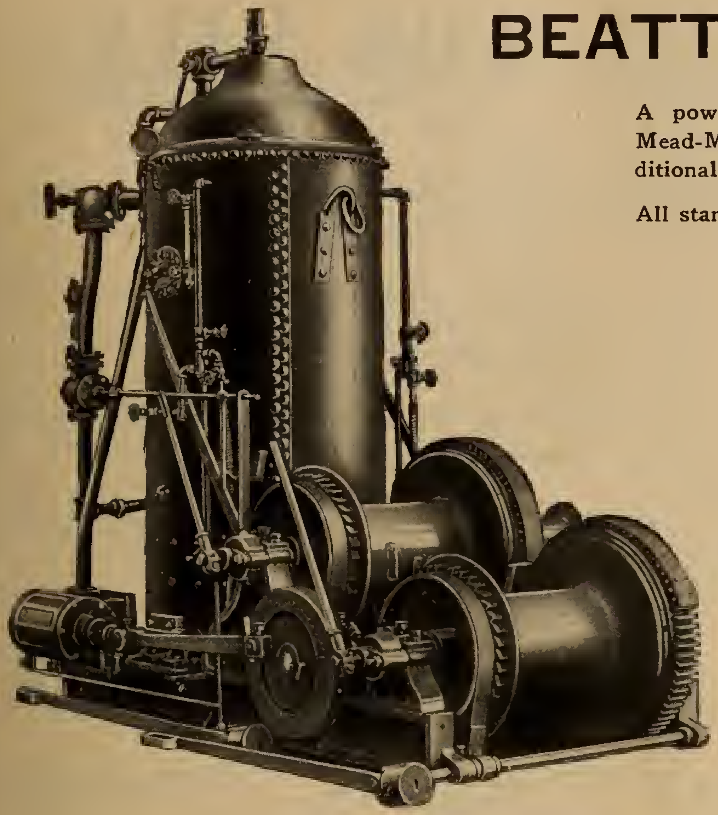

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A powerful and economical steam hoist built by Canadian Mead-Morrison Company. Single or Double Drum. An additional third drum or swinger can be added at any time.

All standard sizes in stock for immediate shipment.

Also

Car Pullers
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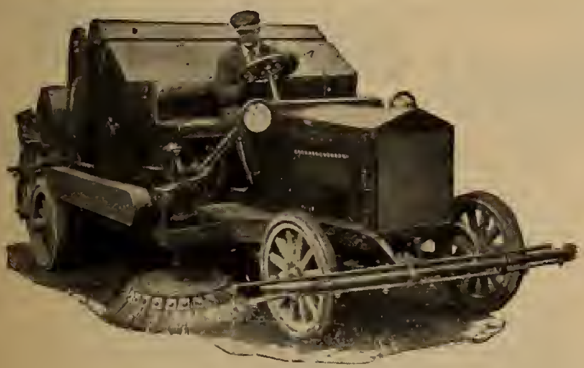

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THE AUSTIN MOTOR SWEEPER

will keep your streets in perfect condition. It actually **removes** all dust and dirt instead of only brushing it up. It will show a definite saving in the cost of your street cleaning.

Our nearest office will gladly send you descriptive matter, prices and costs of operation.

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Approved by the Ontario Provincial Board of Health—

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SPECIAL TYPE F. M.

Swing Check

VALVES

Fig. 481 FLANGED

For use for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.

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Only products of exceptional merit could boast such a record.

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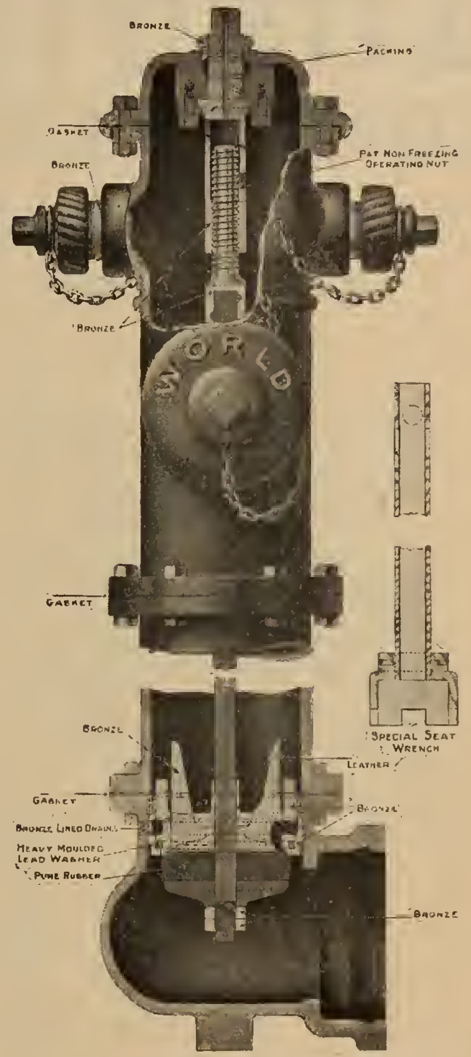

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Goods Guaranteed Good BY Almost A Century's Experience ESTD. 1834

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"MOVES THE EARTH-MIXES THE CONCRETE"
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"ELECTRION" LIGHTING PLANTS
For night construction work,
a reliable electric service.

Your profits are governed by the working capacity and rugged construction of your equipment. The Austin Line is the result of thirty year's experience and study of the engineering problems that confront contractors on all classes of construction. That is why the Austin Line is favored by America's largest and most successful contractors—it stands up and delivers the goods.

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LIMITED
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There is also real efficiency and economy in using this Peer of Pencils—and there is a Venus of just the right degree for every type of your work.

Venus Pencils are the World's accepted standard of quality, uniformly satisfying wherever and whenever purchased.

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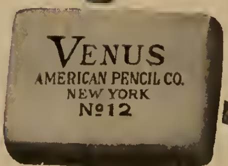

Venus Eraser—same high quality as Venus Pencil
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You Should Certainly Have a Copy

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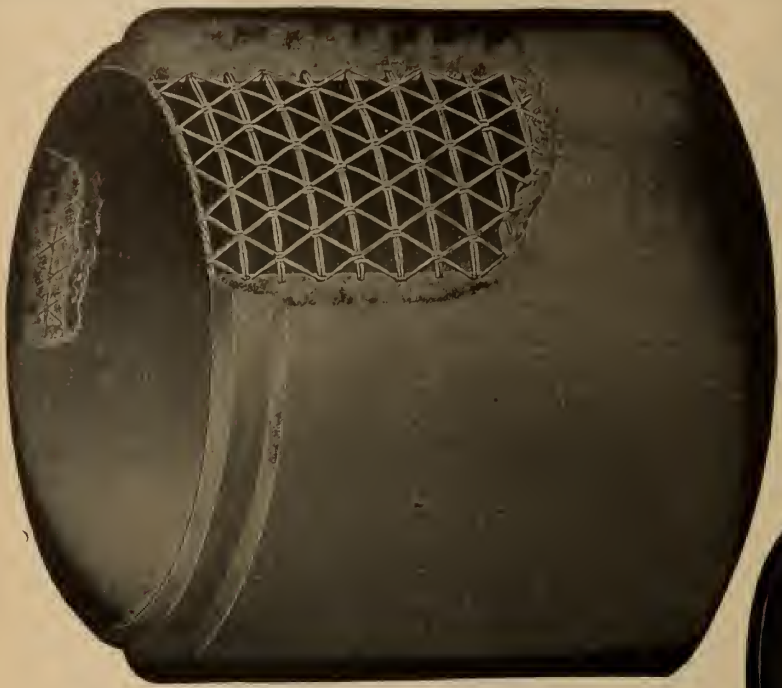

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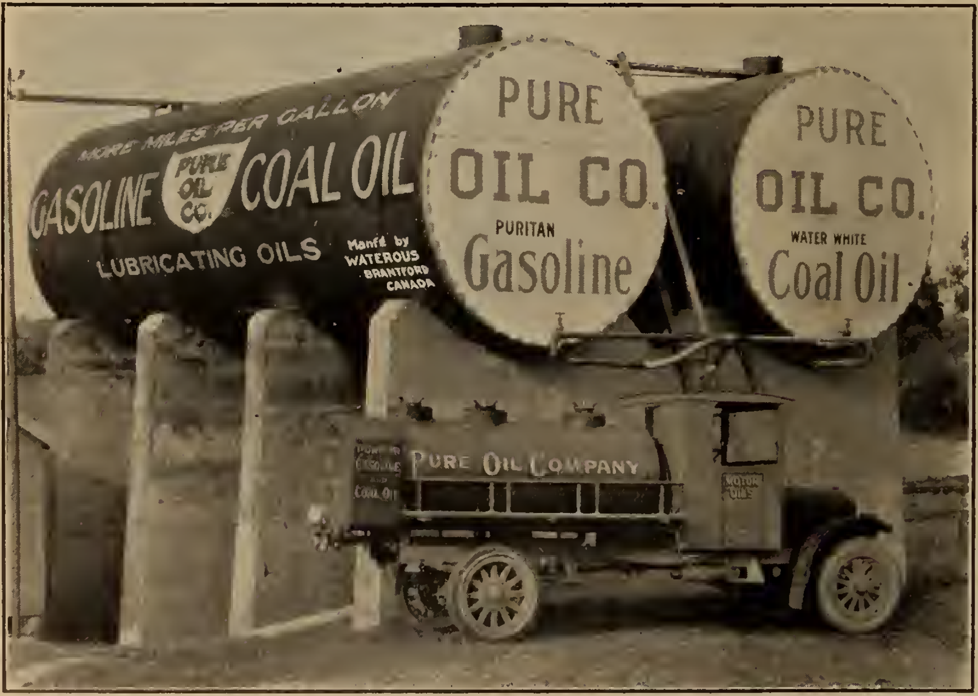

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Misuse of the Word "Engineer"

Members of the engineering profession who hold their calling in high honor view with no little alarm the misuse and abuse of the word "engineer." The extent to which the term is applied to occupations entirely without the profession is indeed appalling and within recent years especially, the name has become attached to so many lines of human endeavor that it has, to a certain extent, lost its professional significance. Thus it is that in the eyes of the public the engineer has come to be associated with the mechanic, the engine operator or some other occupation that does not attain to those ethical standards that class a calling as professional. Constant references to the confusion caused by calling engine drivers and operators engineers have been made in the technical press and at technical meetings and measures have long been urged for the curbing of this loose practice and the informing of the public of the true significance of the engineering profession.

However, whether because the term engineer is so badly misunderstood by people at large or because its use by those engaged in less dignified work may be supposed in some way to add dignity to their calling, it has these last few years seen a variety of applications that are really startling. One of the latest was indicated on a sign appended to one of the booths at the Canadian National Exhibition, which stipulated the occupation of the exhibitor as that of "golf engineer." Investigation discloses the fact that his duties involve the laying out of golf courses with greens, fairways, hazards and other appurtenances that are desirable to give to the game that element of uncertainty that makes it so enticing. But though all this probably calls for some considerable degree of ingenuity and skill, by what reasoning it can be classed as engineering is beyond our power of comprehension. True, engineering has become an involved and intricate art that has demanded specialization, but no real engineer is ready to admit that it has got to the point of being under the necessity of including "golf engineering" as a branch of its multifarious activities.

This is but one instance of the extent to which the real engineer is being handicapped in his professional efforts. Other applications of the word engineer, equally as absurd, are noted in the current issue of "Engineering News Record." Such terms as packing engineer, caterpillar engineer, vocational engineer, which are among those listed in our contemporary, have significances as far removed from the meaning of true engineering as it would be possible to suggest. Yet they and similar expressions are in more or less current vogue, giving to the public an erroneous impression of the engineering profession. In their own interests, engineers certainly should take strenuous action to curb the misuse of their calling. If the profession is to retain what dignity and status it has, let alone increase these, something must be done before the word engineer will have lost its significance entirely.

Twenty-Six Per Cent Ahead of Last Year

During August, construction contracts awarded in Canada, according to MacLean Building Reports, Limited, amounted to $27,488,700, compared with $25,187,500 a year ago. Residential building accounted for 31.3% of the August total, and amounted to $8,630,900. Business building amounted to $7,762,500, or 28.2%; industrial building, $1,778,500, or 6.5%; public works and utilities, $9,316,800, or 34%. The value of contemplated new work reported during August amounted to $32,374,900.

Construction contracts awarded during the first eight months of 1923 amounted to $223,654,400, compared with $184,333,700 during the corresponding period of last year. The increase amounts to $49,320,700, or 26.2%. Residential building during the first eight months shows a falling off of 4% compared with last year, but continues to dominate the various types of construction, with a total of $68,326,400 for the

No. 98

Canada's Engineers—J. L. Cote

The Honourable Jean L. Cote, recently called to the senate, is a technical man who has attained considerable distinction in both his profession and politics. He was born at Les Eboulements, P. Q., in 1876, and received his education at the Commercial Academy of Montmagny, P. Q., and at the Ottawa University. After having successfully passed his examinations, he was admitted to the practice of land surveying in the province of Quebec, latter becoming a Dominion land surveyor. In this capacity he preformed several important surveys in the Northwest and Yukon Territories. In 1900, Mr. Cote decided to establish himself permanently in the West and he at once entered into and successfully carried out, on his own account, extensive mining and other explorations in the province of Alberta, in which field he soon saw his ambitions realized, accumulating quite a large fortune after a short period.

Mr. Cote is vice-president of the Jasper Park Collieries and a director of several other mining organizations of the West. He is also vice-president of the Canada Northwest Mortagage Co. and head of the firm of Cote, Tremblay & Pearson, engineers and surveyors, Edmonton, Alberta.

In 1909 Mr. Cote was elected to the Alberta Legislature as member for the constituency of Athabasca, being re-elected in the constituency of Grouard in 1913 and 1917. In 1918 he was made provincial secretary for Alberta, which portfolio he held until a year or so ago when his government was defeated.

Mr. Cote is also a director of the Corporation of Land Surveyors of Alberta and an associate member of the Engineering Institute of Canada.

Mr. J. L. Cote

The nomination of Mr. Cote to the senate will considerably strengthen the technical profession in the Federal government and undoubtedly his wide experience will make him a recognized authority in matters pertaining to engineering.

year to date. Business building shows an increase of 17%, and the industrial group reflects the steadily improving economic situation with an increase of 66% over last year. Public works and utilities have been undertaken in large volume and record a gain of 55% for the period under review.

Ontario continues to show the greatest activity, and during the first eight months accounted for 50.7% of the Dominion total, compared with 56.3% during the same period of 1922. Quebec has had a very substantial rise in activity, the percentage of the Dominion total being 31,2% compared with 22.8% last year. Construction in the Maritimes has fallen off from 7.9% of the total last year to 2.7% this year. The Prairies and British Columbia remain at approximately the same percentage of the total, viz., 15.4% for 1923, as against 16.7% for 1922.

The trend of the business cycle with regard to the building situation indicates that new construction will continue in considerable volume. There is a great deal of work in prospect and a long continued period of prosperity in view for the building industry. Prices and wages are sufficiently stabilized to make it safe for contractors to bid on new work with the assurance that it can be carried through to completion and yield a reasonable profit. The mortgage market is still comfortable enough to permit a good volume of financing. Labor is fully employed at good wages.

Inadequate Municipal Ordinances

The necessity of proper fire prevention ordinances being adopted by municipalities hardly calls for argument. Yet there are an astonishing number of cities, towns and villages which either have no adequate laws or in which such laws are not effective. Every city and town should legislate so as to control such important matters as building safety, proper electric wiring, storage and use of highly inflammable liquids, removal of rubbish accumulations, etc., and should empower an official to enforce these regulations. According to available statistics, out of some 1,400 of the larger municipalities in Canada, only 237 have upon their statute books laws regulating building construction in any thorough manner. This deplorable condition of affairs, which tends so greatly to the increase of fire losses, can only be remedied by every one interested in fire prevention constantly agitating and endeavouring to promote the adoption of reasonable legislation. To assist in this work, the Fire Marshal of Ontario has in preparation a compilation of requirements for municipalities that should prove of great assistance to towns and villages proposing to enact by-laws to better control the fire hazard.

Canada's Fire Loss Mounts Year By Year

For 1922 it Exceeded $54,000,000 or $6.20 per Capita, the Greatest of Any Country in the World—Public Carelessness and Indifference Encouraged by Fallacious Impressions of the Situation

By RT. HON. SIR GEO. E. FOSTER, G. C. M. G., D. C. L., L.L.D., Etc.
President, Dominion Fire Prevention Association

Do we quite take in the full significance of the fact that in 1922 the fire waste in Canada reached the maximum figure of $54,390,600, or $6.20 per capita of the population? And this, be it remembered, was exclusive of forest fire losses.

Place beside this the further fact that the destruction by fire is a yearly increasing occurrence. In 1898 the total property loss amounted to $7,978,300, or $1.53 per head of our population. In 1908 it was $18,922,100, or $2.91 per head; in 1918 $33,870,000, or $4.12 per head and in 1922 it reached the highest point of waste in the history of Canada. Mass these losses from 1898 to 1922 and we have the enormous total of $517,776,604, or some hundred and a half millions of dollars more than the whole public debt of Canada before the great war began.

That is, notwithstanding the increased intelligence of our people, the improved systems for fighting fires when started and for preventing them from breaking out, the better methods of building, the rigid inspections that have been set up, and the added carefulness from property owners, we are met with a most serious and largely unnecessary destruction of hard-earned wealth, and to a yearly increasing amount. The facts bring us no comfort but they should incite to renewed activity.

An Absolute Loss

There is an impression altogether too common that to the extent that these losses are met by insurance payments they are recouped, and that the waste of wealth is by that much reduced. A little reflection shows, however, that this is not so. The destroyed property represented capital and earnings that formed a portion of the nation's wealth. It has totally disappeared and can be brought back from its dis-united elements by no art of the conjurer. It can only be replaced by new capital and earnings. The loss is an absolute loss.

How far carelessness and consequent fires are due to the prevalence of the impression referred to cannot be definitely stated, but it is without doubt responsible to a considerable degree and the impression should be vigorously combated by every foe to fire waste and every advocate of thrift and resultant prosperity.

Another impression is extensively prevalent, viz: that the fire loss, say for 1922 of over $54,000,000, falls upon the property-owners and the insurance companies and the rest of the community are not concerned therein or affected thereby. This is an utter and a dangerous fallacy. If $54,000,000 worth of property has gone up in smoke and flames it is just that much abstracted from the reserved wealth and working capital of the community, and can only be replaced by fresh earnings of millions of capital and a multitude of men spread over many years. The setback of the nation's prosperity is exactly measured by this diversion of labour and capital to the work of replacement, plus the cumulative loss involved therein.

Nor is this by any means the whole indictment. Every year, municipalities are obliged to bear the burden of waterworks and fire prevention and fire fighting equipment, and keep up a small army of men to operate these services. Mounting fire losses mean additions to protective appliances and necessitate increased taxation for their maintenance. The third party, the general public, is a loser and gets no compensation. The property-owner has the solatium of the insurance payment which partly makes up his loss, and the insurance company recoups itself from the surplus premiums it has assessed on the general body of insurers so as to carry its risks, but the general public gets no set off. If this fact were kept generally in mind, the public would be more alive to fire losses and the necessity for their prevention and elimination.

It is incumbent, therefore, on all the foes of fire waste to possess themselves of these significant facts and give them currency. But space forbids further present pursuit of this vital and baffling problem. It is pitiful to read in every issue of our daily papers of the thousands and tens and hundreds of thousands of dollars that each day and night the fire fiend licks up in his destructive activity, and to think that in so many cases he is aided by the thoughtless carelessness of men and women and in not a few cases by studied criminal complicity. Surely, we should all, from every consideration, use every effort to combat and limit this frightful waste.

Why the Boys Leave the Farms

A farmer in Western Ontario had been reading the news in the papers about building conditions in Toronto. He ruminated awhile and then began to calculate. He figured on the basis of the quotations on farm produce and the "basic wage" agreed upon for plasterers, bricklayers, painters, plumbers and carpenters "in town." Here is the result.

To pay a plasterer for one eight-hour day—33 1/2 dozen or 402 eggs.

To pay a bricklayer for one eight-hour day—10 bushels of corn or the receipts from one-third acre for one year.

To pay a painter for one eight-hour day—14 chickens of three pounds each.

To pay a plumber for one eight-hour day—21 pounds of butter or the output of 7 cows fed and milked for 24 hours.

To pay a carpenter for one eight-hour day—one hog of fair weight, representing eight months of feeding and care.

The Western Ontario farmer looked over the results of his "calculation." "Hm," he said, "I think I'll keep my boy off the farm."

How Building Mechanics Lose Efficiency

Lack of Intensive Training and Constant Shifting from One Job and Supervision to Another Cut Down Their Effectiveness—The Value of Men Trained to Their Jobs

By LEONARD C. WASON
President, Aberthaw Construction Co., Boston, in the official organ of the A. G. C.

Observers who have watched and studied industrial activities covering a wide span of years often lapse into reflective moods and ponder upon the apparent passing of the efficiency of employees in days gone by. They compare present conditions with those that existed when lads became apprentices, learned their trades, worked at them conscientiously and with skill and thus provided the nation with their peak productive abilities. Such conditions stand in marked contrast to those which industry now is forced to meet.

A general lack of intensive training of workmen has combined with presence of abnormal fluctuations of supply and demand to make the average workman of today far less conversant with the niceties of his trade than his predecessor of a few years or decades ago. Constantly moving from one job and supervision to another in his efforts to take advantage of temporary and abnormal conditions, he cuts down his efficiency. No matter how familiar he may be with the job in its generalities, this constant changing prevents him from becoming intimate with his fellow-workmen, with those who supervise his work and with the particular operating policies of his employer.

This factor of inefficiency, intangible as it may appear, is having a marked effect upon the general labor conditions of the country.

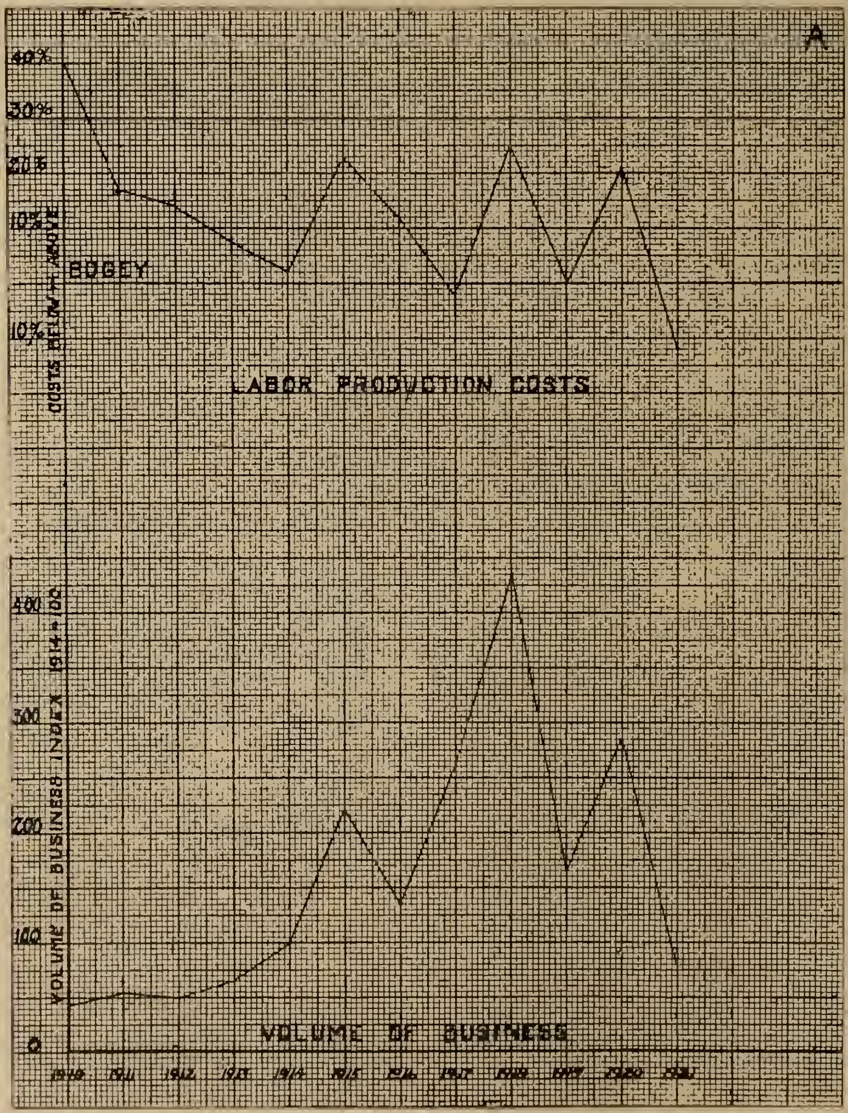


Fig. 1—These two lines show how the training of employees results in ability to hold down costs during periods of peak labor demands

May Reach 50 Per Cent

The value of men trained to their jobs has been held by some experts to reach as high as 50 per cent. over that of employees who are not thoroughly familiar with the fine points of their work and the organization in which they are employed. While this estimate may be rather extreme, it is certain that a wide margin rests between these two values, varying as regards the nature of the work. The above is entirely independent of the artificial and arbitrary limitation of output that is practiced sometimes by labor organizations.

Studies of this phase of the labor problem are highly interesting, for they hold possibilities of developing a means whereby the demands for labor may be met without taking men from one job to another merely through the destructive process of raising wages higher and higher. In addition, it is obvious that an increasing of the efficiency of labor will have its effect in stabilizing industrial operations by holding down the unit costs of labor.

Industries having marked periodic booms, such as have characterized construction activities since the nation began making a distinct demand for industrial expansion, have the greatest reason for applying themselves closely to these studies.

The Aberthaw Company has gained from its research and statistics in this connection a clear demonstration of the value of educating its employees to their jobs in the broader sense, and has gained inspiration for intensive work along this line from the results already achieved.

Dilution of the company's standing crews of

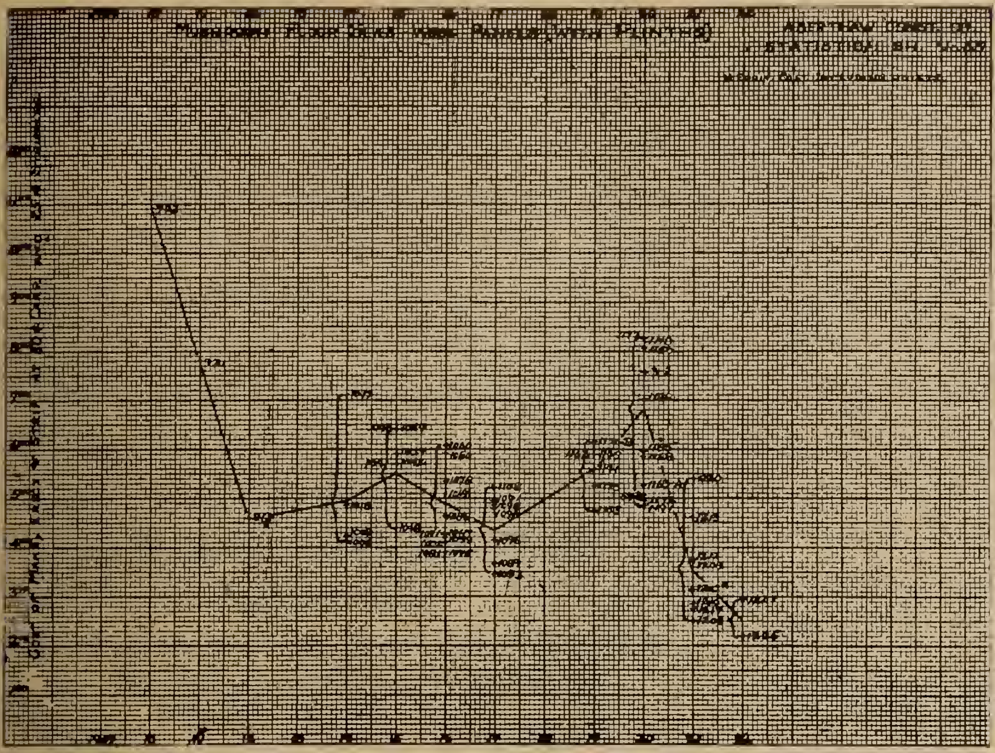


Fig. 2—This chart indicates variation of costs of making, erecting and stripping slab floor forms over a period of years

workmen with outside help in boom periods has resulted, according to its statistics, in a variation in output of from 25 to 35 per cent., with the figure mounting still higher in cases where common laborers are concerned. These conclusions are based upon the experiences and opinions of eleven Aberthaw superintendents who made close observation in 1915 of the effect exercised upon output by the hiring of men in local markets.

Booms Breed Inefficiency

It is impossible to gather statistics covering the work of identical gangs of men in both boom and dull periods, due to the fact that jobs in the stretches of decreased activities are handled almost exclusively by Aberthaw men who follow the company from one job to another and seldom work for another concern. But the effect of bringing "outsiders" in on the jobs in stretches of greater activity may be taken as a fair gauge of the value of training.

The sawtooth appearance of the upper curve in Fig. 1 shows the effect of "good" and "poor" times over a period of eleven or twelve years. The horizontal line marked "bogey" is their standard, the word being borrowed from golf. If it is equalled, they think they are doing very well.

Comparison of the line of labor production costs in this chart with that of the volume of business indicates a decrease in efficiency in "good" times and a corresponding increase in less active periods.

The chart shows that the company was getting results 12 per cent. better than its standard in 1921, which, in spite of the higher wages then paid, made the unit cost of production almost as low per unit in dollars as years ago when labor was much cheaper. This increased efficiency can be credited almost in its entirety to the fact that work in the duller periods was being done by Aberthaw men who "knew their jobs."

The marked inefficiency in the curve of 1910 was due largely to the fact that the company had not previously followed the policy of training men, but rather had followed the more usual method of taking them helter-skelter as the occasion required. The drop from 40 to approximately 15 per cent. of inefficiency during the first year the training policy was in force demonstrated the value of the new plan. The labor production costs kept dropping as a result of this training of men, and continued the decline until the beginning of the war in 1914. Even in 1918, when the volume of con-

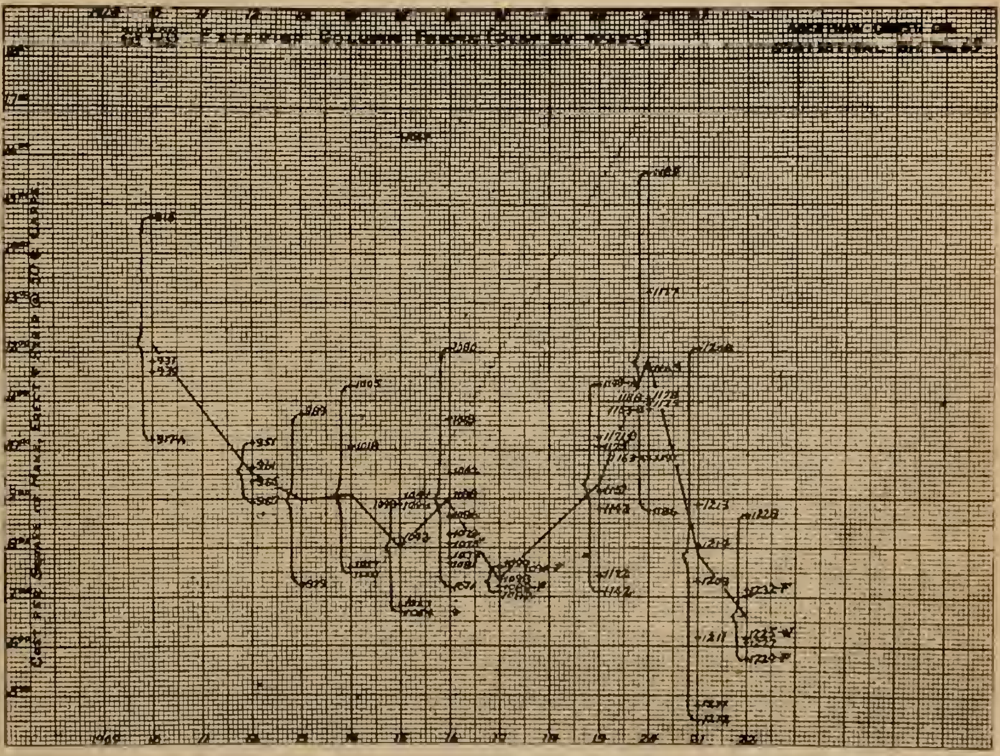


Fig. 3—Indications of great variation of costs during "boom" periods are presented by this chart

struction mounted high, the balancing influence of this training held production costs from going more than a trifle above the 1915 mark, although the total amount of work had almost doubled in that time.

It is interesting to note that labor production costs actually were running opposite to the volume of business in 1912 and 1913, when the demand for labor naturally would have boosted wages so as to send labor costs in the same direction as the demand for labor.

These charts are based on typical jobs of each year, and the lower curve, representing business done by the Aberthaw Company, is corrected for the value of the dollar, so that it is representative approximately of the typical volume of work.

The chart in Fig. 2 shows the cost of making, erecting and stripping flat slab floor forms over a period of years. The cost of each job has been reduced to a standard condition and wages have been weighted in order to produce approximately a measure of production costs. It is interesting to note how costs came down in the slack period of 1916 and 1917 and then at the close of the war period. The company did very little typical construction work in 1918 owing to the fact that its forces were almost entirely engaged in war work, which is not typical, and therefore is not shown in the plot.

The line running across the chart represents a rough approximation of the average unit in the various years. The vertical lines merely brace together the jobs with highest and lowest costs of each year, each job being designated by its serial number.

Training Stabilizes Costs

Job 1203, the lowest cost of 1921, was handled by a 100 per cent. Aberthaw crew, members of which had been with the company for years and were thoroughly trained to the company's work, being specially selected because of their high efficiency and industry gained through this training. This cost of $2.50 per 100 square feet approaches a record.

The job with the lowest costs the following year was supervised by a carpenter foreman who was unusually industrious, active and efficient, working under the oldest superintendent in Aberthaw's employ, Mr. Clasby, who has been continuously with the company since 1897.

The chart in Fig. 3 presents similar data dealing with the costs of making, erecting and stripping exterior column forms.

In both of these charts it is plainly indicated that in dull times the costs of the various jobs were held close together, but that when boom conditions called for untrained labor, the costs went awry, with great variation being shown between the high and low levels.

Following out the thought inspired by this indication, the conclusion logically is that proper training of men engaged in construction work is a direct stabilizer of construction costs.

Any factor that acts to prevent a wide variance arising between job costs of various construction jobs being carried on at the same time exercises the power of creating confidence and certainty in operations. By influence, it tends to increase the period of confidence and decrease the period of uncertainty. Automatically, since labor costs are more stable in periods of confidence, if such terms be applied, the entire movement is to stabilize the industry by action and reaction, with the forces of both action and reaction contributing to the result.

With continuing stabilization of the industry, peaks calling for the use of untrained men on jobs would be eliminated, so that training would be made more generally possible.

So the entire trend of the industry might swing around in a cycle as beneficial to its operations as the present "vicious cycle" of costs, prices and costs is detrimental.

Bringing the subject down to specifics, the experience of the Aberthaw Company seems to prove conclusively that costs may be controlled by an induced efficiency, which will perform remarkably well under fairly normal conditions and will exercise its influence against extreme costs even when the labor demand is at its height.

Responsibility for Fire Damage

Judgment Handed Down by the Supreme Court of Canada Places Onus on Town for Creation of a Fire Hazard

The maxim of the common law, that a person has only the right to use his own property to the extent that he does not thereby injure that of his neighbours, has since the days of the Romans been a fundamental principle with respect to real as well as personal property. Though a man by accident set fire to his own property and damaged his neighbour's house, he was liable for the injury though the cause of the accident may have been the act of a child, employee or agent. In England, by the statute of Anne 6th-1707, he was relieved from liability for the unauthorized act or negligence of his agent or employee as it was considered that the loss of his own property was a sufficient punishment. In the time of Blackstone the law was amended to relieve a person from liability for accidental fire, whether it was the result of his own act or that of his servant. Such is the law of Canada. A man is only liable where the fire is the direct or proximate result of his own intentional or negligent act or that of his servant, agent or employee.

The most recent application of this law of "Neighbouring Liability" occurred in an action for damages taken against the city of Coquitlam, B.C. The case is interesting and instructive because the municipality itself, through its employees, was held to be the culprit and it is noteworthy in that the decision was handed down by the highest court in Canada.

The facts were as follows: The municipal authorities of Port Coquitlam, in preparing rooms for the man serving as chief of police and fire chief, had employed a local plumber to install a stove pipe (the property of the municipality) to a kitchen stove which was the property of the chief. The pipe passed through an attic and out of the building through a shingle roof. Some time before the fire occurred, the stove had been removed by the chief and another one substituted, and one of the sections of the pipe was shortened in such a manner as added to the risk of fire. The fire, it was admitted, originated in the fire hall from the stove in question and it was claimed to have been by the negligence of the town, its servants, or agents and so spreading therefrom as to destroy the property of each of the parties to the action. Particular attention is directed to the fact that under a municipal by-law duly and properly enacted the pipe should have been "enclosed in brick or tile walls with a space of at least three inches between the enclosing walls and the smoke pipe."

The case was first tried with a jury who rendered a verdict in favour of the town. On appeal to the British Columbia Court of Appeal this verdict was set aside and a new trial ordered. The second trial was held, also tried with a jury who rendered a verdict for the plaintiffs, the damages to be determined by the Registrar of the Court. Leave was given by the British Columbia Court of Appeal to the town to appeal direct to the Supreme Court of Canada and the arguments were heard in the closing months of 1922. The finding of the Court, concurred in by five judges and dissented from by one judge, was that the municipality was liable on the ground that it was responsible for the setting of the stove in the first place by its servant whose duty it was to take notice of anything calculated to make the use of it a source of danger. It was further held, in view of the existence of its own by-law and of the fact that the fire would not have occurred if the by-law had been complied with, that the town was prima facie liable for not having taken reasonable means to prevent harm to the neighbours by the escape of the fire.

Ancient Law Justified

The written judgment of Mr. Justice Duff traces from earliest times the responsibility of the occupier of a building or other premises for damages caused by a fire lighted there and escaping, in the course of which he brings out the amending statute of 14 Geo. C. 27, s. 86 by which it was provided: "No action, suit or process whatever, shall be had, maintained or prosecuted against any person in whose house, chamber, stable, barn or other building, or on whose estate any fire shall . . . . . accidentally begin."

While, Justice Duff states, there are points still unsettled as to the effect of this statute, on principle, since it creates an exception to the general rule, the onus ought to be upon the defendant to show that the fire did accidentally begin. He, however, did not think it necessary to pass upon the point for purpose of the appeal, but adds "the effect of the statute is to impose upon the occupier of the premises, the duty to take all reasonable precautions to prevent the fire getting beyond his own premises and doing injury to others." It may be added that he found an obligation to compensate a person suffering damage as the result of the escape of a fire intentionally lighted by their servant in the stove. Following is an extract from the Court's opinion:

> "On the assumption that the relevant fire is the fire that started in the attic, the quesion was this, was this fire ignited by matter escaping from the stove through the negligence of the municipality, that is to say, through the negligence of somebody for whom the municipality is responsible? Now the fire was put in the stove by or by permission of the servant of the municipality who was occupying the premises for the municipality who was aware of the ex hypothesi negligent setting up of the pipes which had taken place some time before. As between the municipality and the caretaker, the caretaker was no doubt guilty of a grave dereliction of duty on this hypothesis in lighting a fire in circumstances which exposed the building to the risk of being burned, but he was nevertheless about the municipality's business and for the negligent conduct of that business it is responsible."

The Week's Developments in a Nutshell

The news of the week is universally good. The anthracite strike is at an end. The Greek-Italian eruption is subsiding and it appears that the Germans have about decided to discontinue their resistance tactics to French occupation in the Ruhr. All authorities agree that European conditions are the key to progress in America and with these two problems out of the way it would seem that our prospects for increased activity this autumn are greatly improved.

The Western Canada grain situation is very encouraging. Both the yield and quality in the northern parts of the prairie provinces are said to be splendid. The West will undoubtedly take another big step this autumn towards clearing up their accumulated obligations.

Construction figures of work under way for all Canada continue to over-top those for the corresponding period of 1922. To the end of August the total of contracts awarded was $223,654,000 as compared with $184,333,700 a year ago and $165,812,000 in 1920. This is a gain of 18 per cent. over last year.

Still another encouraging announcement comes from our Canadian National Railway system. The first seven months of the year show a gain in net earnings of over five million dollars. Last year there was a loss of two million dollars; this year it is a profit of nearly three million dollars.

A prominent supply house writes us from British Columbia as follows: "The building operations in this district at the present time are normal, being mostly residences and stores with prospects for the balance of the year very much brighter. The demand for material is fair with the supply in good shape for the present and a reasonable increase. Prices are firm and have changed very little during the whole season."

The one disturbing factor has been the terrible Japanese disaster. Its effect on Canada however, would appear to be almost negligible.

Concrete Floor Hints for Contractors

The Portland Cement Association Gives Practical Pointers Regarding Heavy Duty Floors for Industrial Buildings, Terrazzo Floors, Colored Concrete, Floor Treatment and Floor Coverings

Heavy Duty Floors For Industrial Buildings

The attractive appearance of terrazzo floors has long been recognized, but the use of this type of polished floor for industrial buildings is not so well appreciated.

The following is a description of the method of laying a heavy traffic floor in an eastern shoe manufacturing plant. This door is subjected to the action of very heavily loaded steel-wheeled trucks, and the method of construction was adopted after tests of the wearing qualities of the floor under severe conditions.

The rough slab was first picked, swept and washed with clean water. One-inch round steel bars were then placed as grounds and leveled up. The floor was again wet down and a 1:1 cement sand grout brushed on. Before the grout had set a 1:2 mixture of cement and trap rock uniformly graded from ⅛ to ¾ inch was dumped on the floor and screeded off. The mixture was as dry as it was possible to dump out of the mixer. The grounds were then removed and the spaces filled with the 1:2 mixture.

Just about the time when the topping material was stiffening up an even coating of crushed trap rock was spread over the entire surface to a depth of ½ to ¾ inch and rolled into the surface with a 150-pound concrete roller. This roller was operated longitudinally and laterally until the entire area had been evenly rolled. A 900-pound roller was used next and last of all an 1,800-pound roller was operated laterally, longitudinally and diagonally. This last rolling brought up some water and fine material to the surface.

As soon as possible after the final rolling the floor was given a hand steel troweling sufficient only to smooth out any of the stone that had been up-ended by the rolling processes. Twelve men were able to trowel about 15,000 square feet of floor in two hours.

As a final operation the floor was ground with ordinary grinding machines using carborundum block and coarse powdered emery with a generous supply of water. The grinding operations were started from four to seven days after the topping had been placed.

After nineteen months of severe trucking these floors are in excellent condition, and due to the smooth and even surface, the trucks do not produce the usual heavy rumbling. This type of construction also appears to hold great promise of solving the problem of floor construction in ice cream factories, packing plants, etc., where the floors are subjected to the action of lactic, buteric or other weak acids in addition to truck traffic.

* * *

Terrazzo Floors

A terrazzo floor finish is a surface of irregular marble or granite fragments embedded in cement mortar and ground to a smooth even surface. A terrazzo finish should preferably be two inches thick. Usually reinforcement is not required.

The terrazzo should be laid, if possible, before the concrete floor has hardened. If the concrete foundation slab is allowed to harden before the finish is placed, it should be left somewhat rough, and when ready to receive the finish it should be carefully cleaned, drenched with water and painted with a grout of neat cement of creamy consistency. Immediately thereafter the binder course of the terrazzo finish should be placed making it 1 inch to 1¼ inches thick. This binder or "filler" course should preferably be a 1:3 cement-sand-mortar. The sand should be clean and well graded. This binder course should be tamped into place and screeded to an even surface.

The placing of the finish is sometimes delayed, but better results are obtained if it follows immediately after the binder course is completed. The finish consists of a mixture of portland cement and marble, or stone chips or screenings, to which a little sand may be added. Some architects specify definite proportions of cement and chips, such as 1:3, while others merely specify that enough cement be used to fill the interstices. This mixture is spread evenly to the proper thickness and rolled; then additional marble chips either of the same size or a little larger are spread over the surface and rolled in. Enough chips should be used so that they will cover at least 85 per cent. of the finished surface.

After the finish course has hardened somewhat (often at the end of twenty-four hours), but before it gets too hard, it should be ground to a smooth, even surface by a rotary rubbing machine, or by hand, using carborundum brick.

By using mineral coloring material and chips of different colors, shapes and sizes, an infinite variety of color and mosaic effects may be obtained. Borders and patterns of contrasting colors can readily be worked out by placing boards in the proper position when the main body of the floor is laid and later filling in the vacant places thus provided with a mixture of the desired color. Joints that are hardly noticeable can be thus secured. Although much larger areas have been laid successfully, it is best to lay terrazzo blocks not over ten feet square in order to provide properly for expansion and contraction.

* * *

Concrete Dance Floors

A satisfactory surface for dancing is usually obtained by giving an existing concrete floor one of the following simple treatments. However, a more perfect surface will be obtained by first grinding the floor with a floor surfacing machine.

1. Liquid soap applied to a floor in the form of a lather and rubbed into the pores with a scrubbing brush will, after repeating the process, produce a uniform, smooth surface. An occasional application of powdered soap to a floor thus treated will keep it in fairly good condition for dancing. If the floor is somewhat rough and porous several coats of the soap treatment will be needed.

2. A mixture of paraffin wax and turpentine may be applied to the floor in sufficient quantity only to

fill up the pores. An excess of the material would produce a sticky film. Both turpentine and paraffin wax should be of a good grade and no more paraffin used than will be completely dissolved in the turpentine. After the turpentine has evaporated, that is, after the floor surface is dry, it should be treated with powdered wax in the same manner as for a wooden dancing floor.

3. Paraffin wax may be driven into a concrete floor by heating the floor and treating it with melted paraffin wax. The object of heating the floor is, of course, to obtain penetration of the wax. The turpentine in No. 2 above is used as a carrier to get the paraffin to penetrate into the concrete surface.

* * *

Colored Floor Finish

It is often desirable to produce a colored floor surface without resorting to special floor tile or terrazzo. Floors of this sort usually are not to be subjected to heavy abrasive traffic so that such weakness as may be introduced by the use of coloring material in the top, or wearing course, is not important. Obviously, the coloring matter should be confined to the top course only.

Only mineral coloring pigments should be used, as other pigments fade rapidly and reduce the strength of the cement to a marked degree. Mineral colors vary in quality and show a tendency to fade, depending on their quality.

The amount of coloring materials added should not exceed 5 per cent. by weight of the cement for heavy traffic floors as larger quantities may affect the strength of the mortar or concrete to an injurious extent. For light foot traffic floors and for ornamental borders 10 percent. may be used and will produce deep shades. Different shades of color can be secured by varying the amount of coloring material or by mixing two or more colors.

Red oxides of iron produce the most permanent red tints. Venetian red should be avoided as it tends to run and fade. Manganese oxide is probably the best material for black, although a high grade of lamp black or carbon black is generally satisfactory. Common lamp black should not be used.

The intensities of shades produced by mineral colors will be slightly increased if the materials are mixed for a longer time than required for ordinary work. It has also been suggested that an application of a solution of magnesium fluo silicate or sodium silicate may be effective in setting the color in the concrete and checking a tendency of the color to fade.

* * *

Concrete Floor Treatments

The efficiency of a concrete floor surface depends upon the workmanship in laying the wearing course and upon proper protection during its early hardening by a covering which will keep the floor damp for at least two weeks. Experience has demonstrated that a wearing course composed of portland cement and a suitable aggregate correctly proportioned, mixed and deposited and properly protected after finishing will produce a satisfactory wearing surface, free from dusting.

If a wearing surface crumbles or dusts under moderate traffic, the wearing qualities of the floor can often be improved by the application of some hardener or treatment. Magnesium fluosilicate, sodium silicate, aluminum sulphate, zinc sulphate and various gums, soaps and paraffins are among the best known substances used to treat concrete floors.

Magnesium Fluosilicate Treatment

The magnesium fluosilicate treatment consists usually in one or more applications of a solution of the silicate. The solution for the first application consists of about one-half pound of the silicate dissolved in one gallon of water. For the second and subsequent applications the solution is made with about two pounds of the silicate to each gallon of water.

Any number of applications of the more concentrated solution may be given to the floor, depending on the condition of the floor and the apparent penetration obtained. In no case should one application follow in less than three-quarters of an hour after the preceding one. The surface treated should be kept wet with the solution for at least three minutes at each application so as to replace any of the solu-

Table of Colors to Be Used in Concrete Floor Finish

Amounts of pigment given in table are approximate only. Test samples should be made up to determine exact quantities required for the desired color and shade.

COLOR DESIRED	Commercial Names of Colors for Use in Cement	Pounds of color required for each bag of cement to secure	
		Light Shade	Medium Shade
Grays, blue-black and black	Germantown lampblack* or	½	1
	Carbon black* or	½	1
	Black oxide of manganese* or	1	2
	Mineral black*	1	2
Blue shade	Ultramarine blue	5	9
Brownish-red to dull brick red	Red oxide of iron	5	9
Bright red to vermilion	Mineral turkey red	5	9
Red sandstone to purplish-red	Indian red	5	9
Brown to reddish-brown	Metallic brown (oxide)	5	9
Buff, colonial tint and yellow	Yellow ochre or	5	9
	Yellow oxide	2	4
Green shade	Chromium oxide or	5	9
	Greenish blue ultramarine	6	..

*Only first quality lampblack should be used. Carbon black is light and requires very thorough mixing. Black oxide or mineral black is probably most advantageous for general use. For black use 11 pounds of oxide for each bag of cement.

tion absorbed at once by the concrete. The primary object of the manner of application is to secure as great a depth of penetration as possible.

Sodium Silicate Treatment

A 20 per cent solution of sodium silicate containing a small addition of an organic acid is applied in two or more coats twenty-four hours apart. Ordinarily the sodium silicate requires considerable time to dry properly so that the floor can be used. The sodium silicate treatment is, of course, inexpensive.

Commercial sodium silicate varies in strength from 30 to a 40 per cent solution. It is quite viscous and requires thinning with water before it will penetrate the floor. Ordinarily it will be found satisfactory to dilute each gallon of the silicate with three gallons of water. Each gallon of the resulting solution will cover about 200 square feet of floor surface one coat. The floor should be thoroughly cleaned of all grease, plaster, dirt, etc., and should be thoroughly dry before the first application of the silicate solution.

Aluminum Sulphate Treatment

The aluminum sulphate treatment consists in one or more applications of solutions of aluminum sulphate to the clean, dry surface. The solution is made up in a wooden barrel or stoneware vessel and the water should be acidulated with about 2 cc. of commercial sulphuric acid for each gallon of water. The sulphate does not readily dissolve and requires occasional stirring for a few days until the solution is complete. About 2½ pounds of the powdered sulphate will be required for each gallon of water and one gallon of the solution should cover about 100 square feet of floor surface. For the first treatment the solution may be diluted with twice its volume of water. Twenty-four hours after this application the normal solution is used and twenty-four hours should elapse between additional applications of the solution.

Zinc Sulphate Treatment

This treatment consists in the application of about a 16 per cent solution of zinc sulphate with about 4½ per cent free sulphuric acid applied in two coats, the second coat being applied four hours after the first one. The surface should be scrubbed with hot water and mopped dry just before the application of the second coat. This treatment gives the floor a darker appearance than the original concrete.

There are a number of compounds of oils, gums, waxes, etc., which are sold as concrete floor hardeners. Pulverized iron mixed with sal ammoniac or some other oxidizing agent is also used both as an integral floor hardener and as a treatment for a concrete floor surface.

Admixtures

There are on the market a number of compounds which are widely recommended for inclusion in the body of the concrete. Instructions for the use of these compounds invariably call for many of the methods and practices which are known to be essential for successful concrete floors built without the inclusion of integral compounds. Poor workmanship or improper methods or materials cannot be compensated for by the admixture of any material other than those used in making good concrete.

Admixtures containing chemicals may interfere with the chemical action between the cement and water. Unquestionable evidence should, therefore, be had about the effect on the concrete of any proposed admixture before it is specified for use.

Floor Paints

Decorative floor paints or coatings may be had in considerable variety from responsible manufacturers. Almost without exception these paints require that the floor be thoroughly clean and dry when the paint is applied.

* * *

Floor Coverings

In certain types of buildings, such as school, office, apartment, hotel and semi-public buildings, some covering on the floors is desirable regardless of the surface of the floor proper.

Experience has demonstrated that the coverings which come under the general classification of linoleums or relatively this coverings should be attached or pasted to the floor surface over the entire surface. Manufacturers' specifications for laying linoleum or cork carpet over felt paper on concrete floors should be followed.

Where it is known beforehand that a linoleum or cork carpet type of covering is to be used, sufficient care should be taken to secure a surface sufficiently even and free from projections that the surface of the linoleum will be free from bumps and ridges and present an even surface. To accomplish this the floor finish known as a one-course floor is recommended. One steel troweling will usually be sufficient.

If the slab is composed of a 1:2:3 mix, or richer, it will be a simple matter to work all of the coarse material into the slab by screeding the freshly placed concrete with a sawing motion of the strikeboard and floating with a wood float. In this process sufficient fine material, that is, cement and sand, will be brought to the surface to enable finishing to be done with a steel trowel without spreading any dry mixture of cement and sand or of dry cement alone on the floor for finishing purposes.

Where it is shown beforehand that the heavier types of floor coverings will be used, steel troweling may be omitted, but in this case the freshly placed concrete should be carefully screeded to previously established grounds with a sawing motion of the strikeboard and the wood floating carefully done so as to be sure of a true surface free from projecting coarse aggregate or appreciable ridges or fins. Such floors should, of course, be provided with some means of fastening the sheets of padding or deadening material used between the carpets or rugs proper and floor surface. If the rooms are small a nailing strip at the bottom of the baseboard around the rooms will be sufficient, but if the unbroken floor surface is very large, it will be necessary to provide inserts in the concrete floor surface into which the floor coverings may be buttoned. These inserts may be placed very easily after the floor has partially hardened so as not to interfere with the work of finishing.

If there is certainty that the floor will never be used to carry traffic directly on the concrete, wooden strips may be embedded in the concrete to be used to attach the floor covering.

Even if at some future time it is found desirable to uncover the floor and prepare it to receive traffic direct or to use the floor for dancing, a new floor topping may be put on the original slab.

For the Building Supply Dealer

Know Your Costs if You Handle Concrete Products

The Keeping of Cost Data is Essential for a Successful Business — Economy Through Continuous Operation

While the producer of concrete products is essentially a manufacturer rather than a dealer, yet there are many building supply dealers throughout the country who carry on the production of concrete products as a part of their regular business. For such dealers, the importance of keeping accurate costs of the concrete product phase of their business needs to be constantly emphasized, for it is easily possible to suffer serious losses unless all operations are closely watched and the costs of each carefully tabulated. The phase of the concrete product business was emphasized in a report of the American Concrete Institute's Committee on concrete plant operation which was submitted at the last annual meeting of the institute. The committee state that much of the ill feeling among competitive concrete products manufacturers over price problems and sales ethics arises from the lack of general knowledge in the industry of proper cost-keeping methods. Competing manufacturers at present have no common standard system of cost-keeping and as a rule the smaller manufacturers do not feel able to pay for proper advice on cost accounting.

A standard system of cost-keeping if adopted by a large number of manufacturers would tend toward greater development of manufacturing operation, more stable prices and a more favorable opinion of the industry by capital. The report further states:

The suggested outline of cost items, sometimes termed the "card of accounts," in their logical order was considered thoroughly and adopted in the form shown below.

After adopting this classification, it is necessary to arrange certain cost record sheets on which to actually collect the information from day to day. Just how this can be best accomplished is a problem.

Agreement could not be reached on (1) whether a perpetual inventory and cost record is of enough importance to justify the expense of keeping it; (2) the extent to which costs should be subdivided and detailed; (3) whether local conditions such as the variety of products made and size of plant would affect the design of the recording system.

System of Cost-keeping for Concrete Products Manufacturers
Card of Accounts.

Investment, Land, Buildings, Equipment.

1. Raw Materials (including cost of transportation and unloading charges):
    Cement.
    Sand.
    Pebbles.
    (Itemized materials which enter into the product manufactured.)
2. Direct Labor:
    All productive labor used from the point where the materials are taken from the bins to and including manufacturing of the product and putting it into the storage yard. This labor to include foreman and assistants when they are engaged in productive labor.
3. Indirect Charges:
    Salaries of superintendent, foreman and assistants when engaged in non-productive labor.

Rentals
Repairs to buildings } not estimated but exact expense incurred
Repairs to equipment

Depreciation on building—Wooden buildings 3 per cent., buildings with masonry wall 2 per cent. This figure may be exceeded when buildings are on leased ground.

Depreciation on equipment—Machinery from 10 per cent. to not over 15 per cent. Other equipment less than 10 per cent.

Fuel
Light } these may be combined if from one source.
Power

Miscellaneous supplies—including all supplies necessary to running the factory not included elsewhere.

Breakage and losses of product.

Taxes—Itemized to include all taxes on property.

Insurances—Itemized to include fire, theft and liability.

Total Manufacturing Cost
(Sum of all items above.)

4. General Administration and Selling Expense:
    Salaries:
        Officers, general manager and other employes, not including salesmen.
        Selling organization.
    Selling expense—including all miscellaneous expenses incidental to selling, such as entertainment, donations, promotion, not included elsewhere.
    Advertising—although an indirect selling expense, it is so prominent it is separated from others.
    Printing, supplies and postage—including all supplies and printing incidental to running the office, but does not include those used in advertising.
    Telephone and telegraph—including all expenses in both factory and office.
    Traveling—railroad fares, automobile expense, carfare, etc.

Collection expense } may be combined.
Legal expense

General taxes—all taxes not included elsewhere.

Interest paid—itemize all interest actually paid for whatever reason on money borrowed for the conduct of the business and not represented by stock or other participation in the divi-

Fig. 1—Cost analysis of the manufacture of concrete block, showing advantage of twelve month's operation
(1,000-Block Plant)

Equipment	$5,500 00	Equipment	$5,500 00
Building	7,500 00	Building	5,500 00
Land	2,000 00	Land	2,000 00
Total	$15,000 00	Total	$13,000 00
Plant Operating 9 Hours per Day for 12 Months (281 Days), Making 281,000 Block.		Plant not Operating December, January, February, or March. Operating 9 Hours per Day for 200 Days, Making 200,000 Block.	

		Total Cost	Cost per Block		Total Cost	Cost per Block
Raw Moterials for 1000 Block:						
15.6 bbl. cement @ $2.40		$37 44			$37 44	
14.4 cu. yd. aggregate @ $0.80		11 52			11 52	
Water		0 00			0 00	
		$48.96	$0 0490		$48.96	$0 0490
Direct Labor:						
Mixer man @ 45c per hour		$4 05			$4 05	
Operator @ 50c " "		4 50			4.50	
Off bearer @ 40c " "		3 60			3.60	
Yard man @ 40c " "		3 60			3.60	
2 laborers @ 40c " "		7.20			7.20	
		$22.95	0 0230		$22 95	0 0230
Indirect Charges:						
Salary, Mgr., $250.00 per month		$3,000 00		12 mo.	$3,000.00	
Repairs to buildings		150 00			110 00	
Repairs to equipment		825 00		(12%)	660.00	
Depreciation on bldg	(3%)	225.00			225.00	
Depreciation on equipment	(15%)	825 00		(12%)	660 00	
Fuel		800 00			400.00	
Light and power		400.00			300.00	
Lubr. and misc. supplies		150.00			100.00	
Taxes, $2.00 per $100.00		300.00			300.00	
Liability insurance		155.64			110.77	
Fire insurance		125.00			125.00	
		$6,955.64	0.0248		$5,990 00	0 0300
Total manufacturing cost			$0 0968			$0 1020
Generol Administration ond Selling Expense:						
Salary, Office Force, $125.00 per montb		$1,500 00		8 mo.	$1,000 00	
Selling expense		300.00			300 00	
Advertising		1,000.00			1,000 00	
Printing and supplies		300.00			200 00	
Telephone		60.00			60 00	
Traveling		600.00			400 00	
*Interest paid		000.00			000.00	
		$3,760.00	0 0134		$2,960.00	0 0148
Total commercial cost			$0.1102			$0.1168
Interest:						
On Accts. Receivable	6% on $7,500	$450 00		6% on $5,400	$324 00	
On Inventory		310.00			000 00	
Investment	6% on $15,000	900.00		6% on $13,000	780.00	
		$1,660.00	0 0059		$1,104.00	0 0055
Total commercial cost for comparison with companies that include their items in their "Total Commercial Cost"			$0.1161			$0.1223
Cost of year's operation	281,000 blk. @ $0.1102		$30,966.20	200,000 blk. @ $0.1168		$23,360.00
Sales at 16c per block			44,960.00			32,000.00
Profit			$13,993.80			$8,640.00

* Interest actually paid on money borrowed for the conduct of the business and not represented by stock or other participation in the company should appear opposite the item "Interest Paid" under the division "General Administration and Selling Expense" and, therefore, it affects the "Total Commercial Cost."
We have shown in detail, under the heading "Interest," figures which would be included if the entire business was conducted on borrowed capital

Fig. 2—Cost analysis of the manufacture of concrete block showing advantage of twelve month's operation
(400-Block Plant)

Equipment	$3,300 00	Equipment	$3,000 00
Building	3,200 00	Buildine	2,500 00
Land	1,500 00	Land	1,500.00
Total	$8,000 00	Total	$7.000.00
Plant Operating 9 Hours per Day for 12 Months (281 Days), Making 112,400 Block.		Plant not Operating December, January, February or March. Operating 9 Hours, per Day for 200 Days, Making 80,000 Block.	

		Total Cost	Cost per Block		Total Cost	Cost per Block
Raw Material for 1000 Block:						
15.6 bbl. cement @ $2.40		$37 44			$37 44	
14.4 cu. yd. aggregate @ $0.80		11 52			11 52	
Water		0.00			0 00	
		$48 96	$0.0490		$48 96	$0 0490
Direct Labor:						
Mixer man @ 45c per hour		$4 05			$4 05	
Operator @ 50c " "		4 50			4.50	
Off bearer @ 40c " "		3.60			3.60	
		$12 15	0 0304		$12.15	0 0304
Indirect Charges,						
Salary, Supt., $200.00 per month		$2,400 00		12 mo.	$2,400.00	
Repairs to building		75 00			60 00	
Repairs to equipment		495.00			360 00	
Depreciation on building (3%)		96.00			75 00	
Depreciation one quipment	(15%)	495 00		(12%)	360 00	
Fuel		300 00			100 00	
Light and power		200 00			130.00	
Lubr. and misc. supplies		100 00			75 00	
Taxes, $2.00 per $100.00		160 00			140 00	
Liability Insurance		97.60			66.90	
Fire Insurance		55 00			55.00	
		$4,473.60	0 0398		$3,821 90	0.0478
Total manufacturing cost			$0 1192			$0 1273
General Administration and Selling Expense:						
Salary, office force, $100.00 per month		$1,200.00		8 mo.	$800 00	
Selling expense		100 00			100.00	
Advertising		300.00			300 00	
Printing and supplies		100.00			75.00	
Telephone		60.00			60.00	
Traveling		400.00			300.00	
*Interest paid		000.00			000.00	
		$2,160.00	0 0194		$1,635 00	0.0204
Total commercial cost			$0.1386			$0 1476
Interest:						
On Accts. Receivable	6% on $3,000	$180.00		6% on $2,200	$132 00	
On Inventory		120.00			000 00	
Investment	6% on $8,000	480.00		6% on $7,000	420 00	
		$780.00	0.0069		$552.00	0.0069
Total commercial cost for comparison witb companies that include these items in their "Total Commercial Cost"			$0 1455			$0.1545
Cost of year's operation	112,400 blk. @ $0.1386		$15,578.64	80,000 blk. @ $0 1476		$11,808.00
Sales at 16c per block			17,984.00			12,800.00
Profit			$2,405.36			$992.00

* Interest actually paid on money borrowed for the conduct of the business and not represented by stock or otber participation in the company should appear opposite the item "Interest Paid" under the division "General Administration and Selling Expense" and, therefore, it affects the "Total Commercial Cost."
We have shown in detail, under the heading "Interest," figures whicb would be included if the entire business was conducted on borrowed capital.

dends or earnings of the company.

Discounts:
  On purchases.
  On sales.
    Total Commercial Cost.
    (Sum of all items above.)

5. Loading Expense:
   Total commercial cost (for comparison with those who include loading expense in their total commercial cost.)
   (Sum of all items above.)
6. Delivery Expense:
   Total commercial cost (for comparison with those who include delivery expense in their total commercial cost.)
   (Sum of all items above.)

Most everyone agreed, however, that the method of recording costs should be such that an inventory and summary of costs could be obtained without undue effort and that such should be made at not too great intervals. Also, that the system should be subdivided sufficiently to give an intelligent record of the major items of expense and less important items could be ascertained by special cost investigation whenever such information is desired.

There probably are manufacturers who think that a cost-keeping system is not justified in a small products plant, or they are too busy during the daytime and too tired at night to look after it. We are firmly convinced, however, that an intelligent record of the cost of doing business is an absolute necessity and that the manufacturer cannot afford to do business without it.

Continuity of Plant Operation

Products manufacturers should strive to keep their plants operating throughout the entire year to secure the greatest economy in production. When designing and building plants, it is desirable to bear this in mind so that the plant will not be too large for the available market and will operate economically under varying weather conditions. Since a plant that operates throughout the year must stock con-

(Continued on page 889)

Construction Developments During the Month of August

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, August, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	5	$ 66,000	1	$ 90,000	....	....	....	....	6	$ 156,000
Churches	13	348,000	6	145,700	1	5,100	....	....	20	498,800
Factories	13	370,500	13	745,500	....	....	....	....	26	1,116,000
Garages, Public	8	49,000	2	19,000	....	....	....	....	10	68,000
Hospitals	2	153,000	1	75,000	....	....	1	10,000	4	238,000
Hotels and Clubs	4	347,000	2	20,000	....	....	2	41,000	8	408,000
Office Buildings	6	168,000	3	49,000	1	11,100	....	....	10	228,100
Public Buildings	6	173,400	3	281,800	....	....	....	....	9	455,200
Residences	1090	4,821,200	424	2,365,100	8	37,000	14	73,000	1536	7,296,300
Schools	28	1,023,300	6	293,000	3	131,200	2	27,000	39	1,474,500
Stores	63	501,500	6	77,000	....	....	....	....	69	578,500
Theatres	1	25,000	....	....	....	....	1	10,000	2	35,000
Warehouses	15	355,500	3	88,000	....	....	1	6,000	19	449,500
Total Buildings	1254	$8,401,400	470	$4,249,100	13	$184,400	21	$167,000	1758	$13,001,900
Bridges	20	221,200	4	100,300	5	41,800	....	....	29	363,300
Dams and Wharves	2	26,700	1	1,800	....	....	....	....	3	28,500
Sewers & Watermains	15	155,400	7	127,900	1	1,200	....	....	23	284,500
Roads and Streets	73	2,651,600	35	1,507,400	4	60,000	6	117,500	118	4,336,500
General Engineering	25	2,353,000	14	972,000	....	....	1	40,000	40	3,365,000
Grand Total	1389	$13,809,300	531	$6,958,500	23	$287,400	28	$324,500	1971	$21,379,700

Construction Contracts Awarded in Western Canada, August, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	1	$ 60,000	....	....	....	....	2	$ 28,000	3	$ 88,000
Churches	2	16,000	....	....	2	9,000	4	52,000	8	77,000
Factories	8	143,500	2	65,000	1	350,000	5	104,000	16	662,500
Garages, Public	3	11,000	....	....	....	....	3	19,300	6	30,300
Hospitals	3	30,300	2	28,000	....	....	1	51,400	6	109,700
Hotels and Clubs	4	34,700	1	5,000	1	12,900	....	....	6	52,600
Office Buildings	3	34,500	1	28,000	1	1,000	....	....	5	63,500
Public Buildings	8	75,000	....	....	3	21,000	2	17,200	13	113,200
Residences	77	293,000	46	145,300	47	176,300	141	476,000	311	1,090,600
Schools	10	136,800	4	152,300	16	215,000	3	71,800	33	575,900
Stores	23	121,300	2	6,000	2	45,000	6	38,800	33	211,100
Theatres	1	4,000	....	....	1	30,000	....	....	2	34,000
Warehouses	7	1,976,000	3	51,100	3	27,000	2	7,500	15	2,061,600
Total Buildings	150	$2,936,100	61	$ 480,700	77	$ 887,200	169	$866,000	457	$5,170,000
Bridges	4	41,200	1	2,000	....	....	8	28,500	13	71,700
Dams and Wharves	1	20,000	....	....	....	....	....	....	1	20,000
Sewers & Watermains	1	55,000	....	....	....	....	5	17,100	6	72,100
Roads and Streets	18	354,500	2	85,200	11	124,000	10	83,200	41	646,900
General Engineering	3	69,300	....	....	2	59,000	....	....	5	128,300
Grand Total	177	$3,476,100	64	$ 567,900	90	$1,070,200	192	$994,800	523	$6,109,000

Further Exhibits at the Toronto Fair

A Supplementary List of Displays of Interest to Engineers and Contractors

In addition to the list of firms exhibiting at the Canadian National Exhibition, Toronto, referred to in last week's issue of the Contract Record the following companies were also represented at the Fair with exhibits of interest to our contractor and engineer readers:

Peckover's Limited had a booth in Machinery Hall, displaying their metal lath and reinforcing steel rods on the walls and "Feralum" anti-slip stair treads on the steps. This company now represents the International Nickel Company in Ontario and Western Canada.

At the **Empire Brass Company's** exhibit in the Industrial building, globe valves up to 4-in, size, gate valves up to 3-in. and curb cocks were shown in addition to their line of plumbing supplies.

The Canada Metal Company Ltd. showed babbit metal for high speed engines; special heavy pressure bearing metal, and lead pipe from 1/8 in. to 12 in. sizes. The smaller goods were very effectively displayed on a moving table, being fastened to the broad surface which was of the nature of an endless belt.

The display of the **Wood Hydraulic Hoist & Body Company** was located in the Ford exhibit immediately inside the eastern entrance to the grounds and included a 1-yd. hand-operated steel dump body. Several of the company's dump bodies were shown on the various trucks shown in the Coliseum.

The Ontario Wind Engine & Pump Company showed wood stave tanks, pumping outfits, asphalt roofing, etc., at their exhibit on the grounds.

The Federal Engineering Company, in the Coliseum, exhibited woven cotton belting for transmission, elevator and conveyor purposes.

The A. R. Williams Co. Ltd. showed several of their very extensive line of machines and tools, including portable wood-working machinery, industrial machinery, etc. The exhibit was located in Machinery Hall.

The Dunlop Tire & Rubber Goods Company had a very complete line of mechanical rubber goods on display in the Industrial Building, including belting, steam and pneumatic hose, fire hose, fittings, hydraulic packing, rubber valves, rubber flooring, etc.

On display in the large tent of Messrs. **Laurie & Lamb**, were a 60-h.p. horizontal-type, cold starting crude oil engine, manufactured by Ruston & Hornsby Ltd., of Lincoln, England, and a Heenan & Froude water cooler, also several views of equipment handled by this company, including pulsometer centrifugal pumps, stereophagus sewage pumps, Heenan oil coolers, activated sludge sewage-disposal plants, Ruston & Hornsby motor road rollers, maxim silencers, steam traps, Bellis & Morcom engines and air compressors.

The International Building

Among the British exhibitors in the International Building were the following firms: Ackroyd & Best, Ltd., of Morley, Leeds, showing glass ware for various industrial purposes, furnace cement and other specialities; Brown Bayley's Steel Works, Ltd., of Sheffield, represented by the Canuck Supply Company, Ltd., of Montreal, exhibiting railway tires, axles, springs, etc.; John Davis & Son (Derby) Ltd., showing surveying instruments, mining dials, electric blasting apparatus, etc.; Thos. Firth & Sons Ltd., of Sheffield, represented by Thos. Firth & Sons Ltd., of Montreal, displaying tool steel and "Stainless" steel, especially used in the manufacture of valves, tubing railings, etc.; J. W. Marshall & Co., Walsall, showing light steel sections; Mellowes & Co. Ltd., Sheffield represented in Canada by Holden Company, of Montreal, with a line of iron and steel, particularly for railroad work; North-Eastern Marine Engineering Co. Ltd., of Wallsend-on-Tyne, exhibiting several photographs of installations of marine deisel engines, geared turbines, feed pumps, feed water headers, centrifugal pumps, feed water filters, superheaters, etc.

Other exhibits on the grounds interesting to the building industry were those of Canadian Vickers Ltd., of Montreal; J. I. Case Threshing Machine Co., of Racine, Wis.; Cleveland Tractor Co. of Canada, Ltd., of Windsor, Ont.; Dominion Truck Equipment Co. Ltd.. of Kitchener, Ont. The exhibits of Atlas Engineering & Manufacturing Co., of Toronto, Dodge Manufacturing Co. Ltd., of Toronto, International Nickel Co. of Canada, Ltd., of Toronto, Keighley Gas & Oil Engine Co. Ltd., and Prest-O-Lite Co. Ltd., of Toronto, were included in the displays of Machinery Hall. Other manufacturers of truck equipment located in the West Annex of the Coliseum and not mentioned in last week's list, were Chevrolet Motor Co. of Canada, Ltd., of Oshawa, Ont., Durant Motors of Canada, Ltd., of Toronto, Garford Motor Trucks Co., of Lima, Ohio, International Harvester Company, of Canada, Ltd., Hamilton, Ont.; National Steel Car Corporation, Hamilton; Pierce-Arrow Motor Car Co., of Buffalo, N. Y.; Reo Motor Car Co. of Canada, Ltd., Windsor, Ont.; and General Motors of Canada, Ltd., Oshawa, Ont.

The British Department of Overseas Trade's booth in the Government Building showed several lines of British-made goods, including samples of wire rope manufactured by Wilkins, Wire & Wire Rope Ltd., of Eastwood; a hoist and drills by Holman Bros. Ltd., of Cambourne; a dynamo by the Lancashire Dynamo & Motor Company, and barometers, ets., by Short & Mason, Ltd.

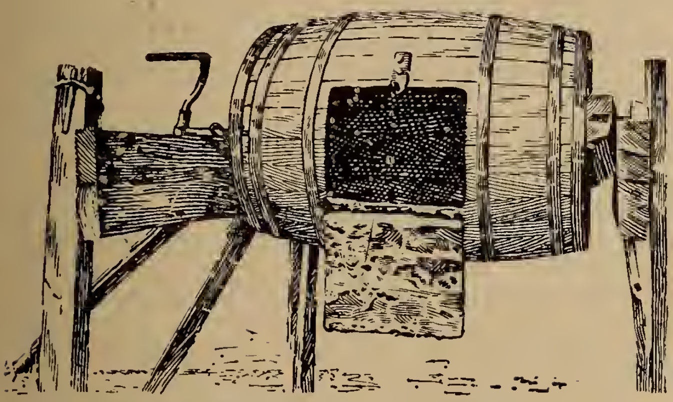
In the Industrial Building were also located exhibits by Anaconda American Brass Ltd., of New Toronto; Gutta Percha & Rubber Ltd., of Toronto, National Equipment Co. Ltd., of Toronto; Northern Electric Co. Ltd., of Montreal; Refrigerating Engineers, Ltd., of Toronto, and a very interesting exhibit showing the entire process of manufacturing Mazda electric bulbs, by the Canadian General Electric Company, of Canada. This company also had displays in the Coliseum and the Electrical Building.

At the Canadian National Exhibition, Toronto, the buildings have more than 1,250,000 square feet of exhibit space.

Hints for the Contractor

Barrel and Automobile License Plates Form Tar Cold Patch Mixer

A very simple form of mixer for making up tar cold patching aggregate is shown in the illustration herewith. As described by J. S. Crandell in Engineering News-Record, it consists of a strong barrel with a door cut is on one side and hinged so that it may be securely shut and latched. On the inside three old motor license plates are bolted so as to form blades to assist in churning the mix. The barrel is mounted on strong supports, and a substantial crank is attached to the axle on which the barrel revolves. One man can do the entire work of mixing, and can supply sufficient material to keep a small maintenance gang busy. Or, where there is maintenance patrol by single patrolmen, this simple mixer is all that is required to make up the daily batch.


Home-made device mixes tar cold patch

This mixer has been in operation for a year, and the output has taken care of the needs of one patrol gang's section.

The apparatus illustrated could be improved by making it more substantial. A steel drum might be substituted for the wooden barrel, and a rigid support mounted on wheels so that the mixer might easily be moved from one location to another.

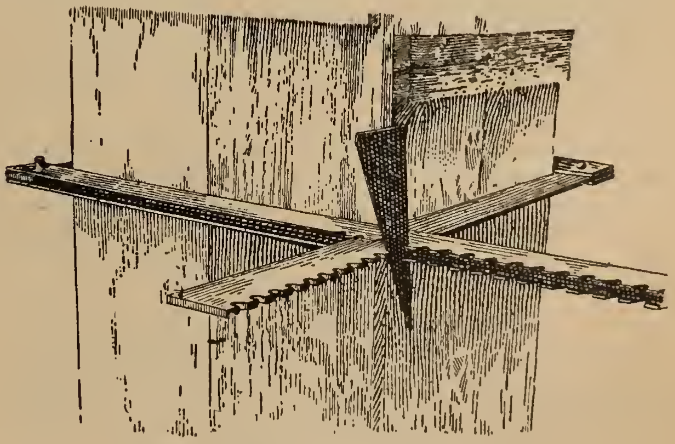
Metal Clamps for Concrete Column Forms Saves Cost and Time

Concrete column forms on a building, just completed in San Francisco, were held in place by a new type of clamp which, according to the general contractors, saved $1,500 on this job over the cost of accomplishing the same purpose with the ordinary wooden clamps. A further economy resulted from being able to fill the column forms to the top in one continuous operation as fast as the concrete could be dumped from the buggies. The surrounding slab was poured as soon as the column form was full, the runway for the buggies being moved back as the pour advanced and each succeeding column being filled as it was reached. This reduced the number of runways required to make the pour and also the labor of shifting them around. Since its success on this job the device has been patented as the "Wedge Notch Form Clamp."

The clamps consisted of two pairs of intersecting arms, 3 ft. long, and two wedges. Each pair of arms consisted of one double bar (two 2½ x 3/16-in. pieces) and one single bar (one 2½ x 5/16-in. piece). The single bar was held between the double bars by a ½-in. loose rivet which was secured with a cotter pin. The double bar was held together at the other end and at the center by countersunk rivets with 3/8-in. washers as spacers between the bars.

The ends of the bars were notched, the notches being on the outside of the arms and set at an angle of 45 deg. with the longitudinal axis. The wedges were 8 in. long, ¼ in. thick and tapered from a 2-in. width at the top to a ¼-in. bottom width. The complete clamp weighed 37 lbs. or about the same as the wooden clamp which it replaced. In the size used on this building the clamps were adjustable to any rectangular column from 6 in. to 30 in. square. This range was made possible by a hole in each arm half way from hinge to notch into which the loose rivet hinge could be transferred when clamping smaller sized forms. The loose rivet was used in place of a bolt to avoid delay in making shifts that might otherwise be due to rust or concrete in the bolt threads.

The column forms were made on a bench, placed in the usual way and held temporarily by nailing the edges of the panels together at bottom, center and top. The first steel clamp was then placed 9 in. above the floor and each succeeding clamp 18 in. above the one last placed. In setting the clamps the single bar in each pair of arms was slid through the double bar in the opposing pair until all four arms rested against the form. The wedges were then inserted so as to engage opposed notches and driven home with a hammer. It was found that the wedges exerted sufficient pressure to draw the form boards tightly together and prevent any leakage of water and cement.


Close view of the clamp in position on form

As the forms were set higher up the column the men soon found that they could climb up on the clamps, hooking one knee over the projecting arm next clamp below. In this way, and taking the average for the job, the seven clamps on a column were placed by two men in twelve minutes and one man stripped the seven clamps and piled them at the base of the column in four minutes. These figures, which give an average for clamping and stripping of one man's time for four minutes on each clamp, were used in estimating the comparative saving of the metal clamps over wooden clamps. The cost of using wooden clamps was estimated on the basis of lumber costing $35 per M. or 35 cents per clamp, framing 40 cents and removal 5 cents, or a total of 80 cents per wooden clamp.

The first storey columns on the street fronts of this building are T-shaped. To use the steel clamps on these columns 2-in. filler blocks were cut to fit between the stem of the T and the clamps.—From Engineering News-Record.

How Should Theatres and Halls be Built?

The Portland Cement Association Have Developed a Set of Regulations That are Recommended as a Model for Widespread Adoption with Such Modifications as Suit Individual Requirements

(Continued from last issue)

Section 65. Aisles and Passageways

Width of Aisles. Aisles having seats on both sides shall be not less than 2 feet 10 inches wide at the beginning and shall increase in width toward the exits at the rate of ¼ inch per foot of run; or the aisle may have a uniform width no less than the average width of the foregoing calculation; but no wall aisle shall be less than 3 feet wide and no other straight aisle shall be less than 3 feet 6 inches wide.

Where main aisles are longer than 40 feet, there shall be a cross aisle leading to each required side exit. Cross aisles shall be not less than four feet wide.

Passageways and Foyers. Passageways and foyers shall be of width required under Section 63, and in no case less than 5 feet wide, and shall be so designed and apportioned as to prevent congestion and confusion. Passageways and foyers which serve as means of egress (whether usual or emergency) shall be at least equal in combined width to the required width of the stairway, passageways or doors leading to them.

Inclines and Aisled Steps. To overcome any difference in level between courts, corridors, lobbies or passageways on the ground floor, inclines shall be employed. Inclines shall not exceed one foot of rise to five feet of run.

Steps in balcony aisles shall extend the full width of the aisle.

Obstruction. All aisles and passageways shall be kept free from camp stools, chairs and other obstructions, and no person except an employe shall be allowed to stand in or occupy any of the aisles, foyers or passageways during any performance or public gathering.

Section 66. Elevator Enclosures

All elevators shall be enclosed with standard fireproof enclosures designed and built in accordance with Section 19, under the paragraph headed "Standard Fireproof Enclosure or Partition."

Section 67. Stage

Where Required. The requirements of this section shall apply to all theatre stages, except that in a motion picture theatre an open platform not more than 8 feet in depth will be permitted in front of the motion picture screen, provided such screen is a stationary fireproof or semi-fireproof wall or partition, and the space behind such screen (if any) is entirely separted from the platform and auditorium by such partitions, and the platform has no curtain or scenery.

In a private assembly hall having a stage or platform which is more than six feet wider or higher than the proscenium opening, or which is equipped with movable scenery, such stage shall be protected as required by this section. (See Section 58.)

Proscenium Wall. The proscenium wall shall completely separate the stage from the auditorium, and shall be of brick, plain or reinforced concrete, or other approved material, with all steelwork fireproofed, except as follows:

In a private assembly hall, a fireproof partition may be used.

In any theatre or hall which accommodates not more than 400 persons, a semi-fireproof partition may be used.

The proscenium wall shall extend from the basement floor to the roof, except in fireproof buildings. It shall contain not more than two openings of not more than 21 square feet each (excluding the proscenium opening). Such openings shall be provided with standard fire doors, or (where a semi-fireproof partition is permitted) with wood doors lined with metal on the stage side.

Fireproof Curtain. The proscenium opening shall be provided with a rigid fireproof curtain or a curtain of asbestos conforming to the following specifications, or of equivalent approved construction. Detailed plans and specifications for such curtains and their operating mechanism shall be submitted to the Building Inspector for approval, before installation.

Asbestos curtains shall be substantially woven of asbestos fiber not less than 95 per cent. pure and shall weigh not less than 2½ pounds per square yard. All seams shall be lapped not less than one inch and sewed in two rows with not less than 1/16-inch pure asbestos twine. At the top and bottom of the curtain a 1½-inch (or larger) pipe shall be placed and shall be securely fastened in and covered by the curtain. The curtain shall overlap the proscenium wall not less than 12 inches at each side and at the top, and shall be guided at each side by metallic loops or rings sliding on a steel cable. No combustible paint shall be used.

For curtains of any type, the connections between curtain and wall shall be made as nearly smoke-proof as possible. Provision shall be made to prevent the curtain from leaving or binding on the guides under any conditions. No part of a curtain or any of the curtain guides shall be supported by, or fastened to any combustible material.

The hoisting apparatus for the curtain shall be designed with a factor of safety of 8 or more.

Besides the regular operating mechanism there shall be an emergency device which will allow the curtain to drop by gravity. The device shall be so arranged that it can be easily operated by hand from each side of the stage and from the fly galleries, and also that its operation will be controlled by fusible links placed on each side of the stage, and when thus operated it shall descend at its normal rate of speed

The curtain and its operating mechanism shall be so designed and constructed at all points, whether specifically mentioned or not, as to form an efficient and reliable barrier against fire and smoke, according to the best practice.

Note. This curtain shall be raised at the commencement and lowered at the close of each performance.

Rigid steel curtains, insulated with asbestos, are recommended as giving the best protection, especially in large theatres.

Automatic Ventilator. The stage shall be provided with one or more automatic ventilators placed near the center and above the highest part of the stage, with the bottom of the opening at least 3 feet above the roof, and having a combined area equal to at least 8 per cent. of the area of the stage floor. Vertical louvre openings shall be not less than twice the sectional area of the shaft. The ventilator shall be designed and constructed so as to open by gravity, and so as to effectively overcome the effects of neglect, rust, dirt, frost, snow, heat, twisting, or warping of the frame work. The louvres or dampers in the openings shall be held closed by cotton or hemp cords running to the stage floor close to each stage door. Fusible links shall be inserted in each cord near the ventilator.

Stage Vestibules. All entrances to the stage shall be vestibuled in such manner as to protect the curtain, scenery, and auditorium from draughts of air.

Footlight Trough. The footlight trough shall be made of incombustible material.

Fireproof Paint. All stage scenery, curtains, and decorations made of combustible material, and all woodwork in or about the stage, shall be painted or saturated with some incombustible material or otherwise rendered safe against fire.

Section 68. Dressing Rooms, Property Rooms, Etc.

All dressing rooms, property rooms, and other storage or workrooms shall be built of incombustible material throughout and shall be separated from the stage by fireproof walls or partitions.

No dressing room nor employes' room shall be placed more than one story below the grade line and no dressing room shall be placed above or below the auditorium.

Section 69. Boiler and Furnace Rooms

Every boiler or furnace room, including breaching, shall be enclosed with standard fire walls and with fireproof ceiling and floor each designed to carry a live load of at least 150 pounds per square foot; except that in the case of a private assembly hall accommodating not more than 300 persons, the floors and walls of the boiler or furnace room shall be incombustible, but fire doors and fireproof ceiling will not be required.

Note. The boiler or furnace room shall not be located below the stage, auditorium, foyer, or exits.

Section 70. Heating and Ventilating

Every theatre and assembly hall shall be provided with a ventilating system which will furnish at least 1,200 cubic feet of fresh air per hour, for each person accommodated in the auditorium, and which will also change the air at least six times per hour in all other occupied parts of the building. The fresh air shall be taken from the outside of the building and no vitiated air shall be re-heated unless it has been washed by a mechanical air washer of approved design. No floor register for heating or ventilating shall be placed in any aisle or passageway unless such register is reinforced with suitable wrought iron or steel ribs not more than 12 inches apart. Radiators in passageways or auditoriums shall be recessed, or elevated at least 7 feet above the floor.

Section 71. Lights

Oil and Gas. No. oil lamp shall be used in or about any stage containing scenery.

No gas lighting of any kind shall be used on any stage containing scenery, nor in any property room, storage room, scene dock, or fly gallery. Gas fire used for heating water, etc., shall be enclosed in iron jackets.

Exit Lights: Theatres. Exit lights shall be provided over all exits (both usual and emergency) and in such other places as may be necessary to direct the audience, performers, and employees to a street or alley. Such exit lights shall be either—

(1) Electric lights.

(2) Candles, or oil lamps using non-volatile oil and floating wick; such lights shall be properly shielded from drafts and from adjacent woodwork or other combustible material.

Note. If such candles or oil lights are used, the management must be particularly careful to see that the lights are properly maintained and lighted before every performance.

Every light over an exit (both usual and emergency) shall be provided with a red illuminated sign bearing the word "exit" or "out" in plain letters at least 5 inches high, or a similar sign shall be placed below a red light.

All public parts of the theatre (except the auditorium), and all exit lights, shall remain lighted throughout every performance and until the audience has left the building.

Exit Lights: Assembly Halls. Every assembly hall in which the auditorium is not kept lighted throughout every performance or entertainment, shall be lighted the same as required for theatres, as described elsewhere in this section.

In all other assembly halls, all stairways, passageways, and exit doors shall be properly lighted and shall remain lighted throughout every performance or entertainment and until the audience has left the building. Emergency exit doors shall be marked with red lights.

Section 72. Toilet Rooms

Separate toilet rooms in connection with the auditorium shall be provided for males and females. One closet shall be installed for each 200 females or fraction, and one closet and one urinal for each 300 males or fraction, assuming the audience to be equally divided between males and females; except that in dance halls there shall be provided one water-closet for each 100 females or fraction, one urinal for each 150 males or fraction and one water-closet for each 300 males or fraction.

There shall be separate water-closets provided for males and females in connection with the stage of every theatre which accommodates more than 500 persons, except theatres used for motion picture exhibitions only.

Separate drinking fountains shall be provided for the stage and auditorium.

One washbowl shall be provided for every two closets or urinals, or fraction.

Section 73. Fire Protection

Standpipes. One or more standard interior standpipes shall be provided on the stage of every theatre and every private assembly hall which has a stage (see Section 67). Each hose shall be not more than 75 feet long, and where such hose will not reach all parts of the stage section (including dressing, property, storage and work rooms) additional hose connections and hose, or additional standpipes shall be provided.

Fire Extinguishers. Standard fire extinguishers shall be provided as follows:

All theatres, including motion picture theatres:

Two on stage (if more than 1,500 square feet of scenery is used).

One on stage or platform (if not more than 1,500 square feet of scenery is used).

One in motion picture booth, or in ticket office if there is no booth.

One in dressing room section.

Public assembly halls, and private assembly halls which have a stage:

One on or near stage or platform.

One in or near ticket office (if capacity of hall is more than 500 persons).

Extinguishers shall be properly exposed to view and always accessible.

Automatic Sprinklers. Every theatre which accommodates more than 600 persons shall have approved automatic sprinklers on the stage, under the stage, under the fly galleries, and under the stage roof, but not in the automatic ventilator.

Fire Alarm. Every theatre which accommodates more than 1,000 persons shall have a fire alarm box on the stage.

Section 74. Mirrors: False Openings

No false opening giving the appearance of a door or window, where none exists, shall be placed in any part of a theatre or assembly hall used by the public.

No mirror shall be placed in any part of a theatre or assembly hall used by the general public except in the women's and men's retiring and toilet rooms.

Section 75. Motion Picture Machines and Booths

Definition. By the term "picture machine" as used in this code is meant any device used to project upon a surface moving pictures of any character which an audience is admitted to view.

Construction of Booth. Every picture machine using a nitro-cellulose or other inflammable film shall, before being operated, be installed in a booth constructed entirely of fire resisting material, such as brick, tile, concrete, two-inch plaster on metal lath and metal frame or of sheet iron or asbestos sheathing as specified below; provided that approved types of portable motion picture machines may be used without a booth in factories and offices where employes are assembled for instructional purposes, or in assembly halls having a floor area of not more than 1,200 square feet, where not more than two exhibitions are given each month. In every case where a booth is not used a tight metal cabinet shall be provided and used for storing metal containers of films not in use.

Note. No portable motion picture machine will be approved which does not have an incombustible housing (metal or asbestos board or equivalent) and which does not provide for automatically insulating or cutting off the light and heat from the film and operating mechanism when the same is not in motion for projection purposes.

The size of the booth (for one machine) shall be not less than 5 feet by 5 feet by 6 feet high. (Note. Booths at least 6 by 6 by 7 feet are recommended).

Every booth made of sheet iron or asbestos sheathing shall have its frame constructed of not less than 1¼ x 1¼ x 3/16 inch steel angles or tees, properly braced to secure rigidity, and securely riveted or bolted at joints. The sheathing shall be not less than No. 20 U. S. gauge sheet iron or ¼-inch hard asbestos wood or lumber, securely riveted or bolted to the frame. No sheet metal booth shall be placed nearer to any combustible partition, wall, or ceiling, than 12 inches.

The floor shall be constructed of the same material as the sides and top, or of concrete. If the floor is made of sheet metal, it must be well riveted, or bolted to frame, and covered with a rubber or cork matting.

Door. The door shall be not larger than 2 by 5 feet, and shall either be of the same construction as the booth, or at least ¾ inch thick and clad with metal not less than No. 28 U. S. gauge. The door shall swing outward, and close automatically, either by means of a spring on the outside or by a metal rope and weight.

Openings. The openings for the operator's view, or for the picture, shall be not larger than 12 inches square, and shall be provided with a gravity door, of the same construction as specified for the booth, held open by fusible links placed in series, so arranged that one of the links is suspended directly over the film when it is in the slide of the apparatus; or the door shall be so arranged as to be closed, except when held open by pressure of the operator. Such door shall not be locked or held open in any manner except as here described.

Ventilation. Each booth shall be provided with a metal ventilating pipe not less than 12 inches in diameter, extending outside of the building.

Note. If a 12-inch outlet pipe is impracticable, a smaller pipe may (if approved by the building inspector) be used if provided with an efficient rotary power fan.

If a standard fire window is provided not less than 4 square feet in area, connecting with the outside air, and opening not less than one-half, then the ventilating pipe may be omitted. In a private assembly hall where the picture machine is operated only occasionally and for short periods of time, the ventilating pipe may be omitted.

Electric Wiring. All electric wiring in the booth shall have an approved slow burning insulation. Each lamp connected with a picture machine shall be provided with a separate switch located within the booth.

Machinery & Equipment

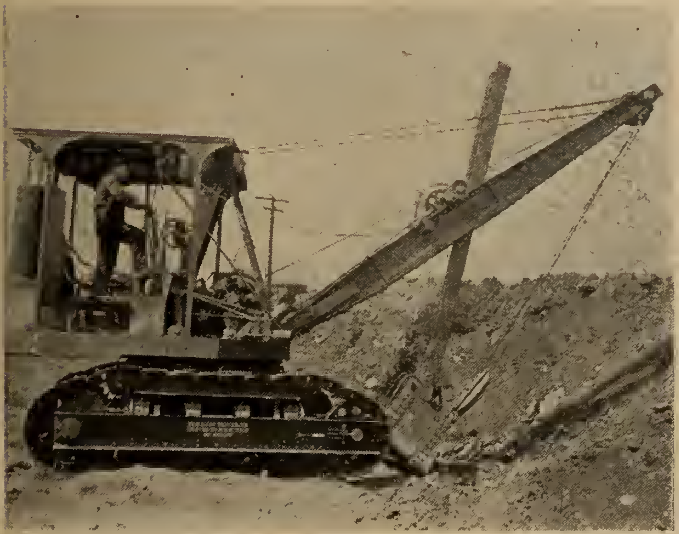
A New Gasoline Dipper Shovel

A gasoline-driven power shovel operated entirely with gears and shafts is announced by the Orton & Steinbrenner Co., manufacturers of cranes, shovels and buckets, of 608 South Dearborn St., Chicago, with factory at Huntington, Ind.

The steam-driven type of shovel has long been in use and has proved very successful. During the past few years, on account of the development of the gasoline motor, various schemes have been put forward in an attempt to adapt this form of power to a dipper shovel. The principal difficulty was that it became necessary to provide an arrangement to take the place of the independent source of power for the reversible crowding motion of the dipper stick. With the steam-operated type, this is accomplished by means of a small steam engine geared directly to the dipper shaft, but with the gasoline or electric type, this was not feasible, and other means had to be developed.

Sprocket and chain arrangements and wire rope drives, while temporarily successful, cannot and will not stand up under severe usage. They are makeshifts. Especially is this true where the cables are bent over a number of small diameter sheaves and drums, and reversing curves are introduced. Loss of power and frequent breakage render the rope type of drive absolutely unreliable.

On the new Orton & Steinbrenner machine a positive gear drive is used which is simple and has only a small number of parts. At the bottom of the boom connection is a shaft carrying double steel bevel gears and bronze friction clutches. This shaft is concentric with the pivot of the boom and is consequently independent of its position. The boom can be used at any angle to suit the exigencies of the work.



Orton and Steinbrenner's latest shovel

Along the boom is a steel shaft carrying two bevel pinions, one meshing at the bottom with the gears on the horizontal shaft, and the other at the top meshing with gears on a countershaft located about half way up the boom. This latter shaft carries a brake and "slip friction," and is geared directly to the cast steel rack on the dipper stick. With this arrangement, a minimum number of levers are required.

The hoisting mechanism is rugged and simple in construction; in fact, it is the same as in the locomotive cranes built by the Orton & Steinbrenner Co. for fifteen years. The simplicity of parts is also of great advantage in converting the shovel into a clam shell outfit, drag line, or skimmer rig.

The power is supplied by a heavy duty 4-cylinder "Climax" motor, which is designed with a view to the economical use of gasoline, and the consequence is that the cost of operating is extremely moderate.

Another exclusive feature of the machine is the flexible crawling tread. These flexible treads adjust themselves readily to the ground surface, equalizing the weight of the machine and distributing it over a considerable length of tread, instead of concentrating it on one roller or tread casting. Alemite fittings are used exclusively for lubrication.

Steering is accomplished by one man in the cab. The drive is by means of steel shafting and bevel gears throughout, positive power being secured always. The main gears are large size, slow moving and shrouded.

On the main horizontal drive shaft are two brake wheels by means of which each tread may be operated independently or both may act together. The mechanical differential arrangement is exactly similar to that used on automobiles.

When used as a crane, the only thing required is to take off the shovel boom and attach the crane boom; the crowding frictions for operating the dipper being carried by the shovel boom and an integral part of it are removed with it. Absolutely nothing else is necessary. The shovel when furnished with double drums can be used interchangeably with the crane. This feature alone saves the cost of a new machine. With the crane boom attached, any of the various types of buckets or scoops can be used, such as clam shell. drag line, skimmer, scoop, or trench hoe; pile driver leads may be swung from the tip of the boom.

For The Building Supply Dealer

(Continued from page 882)

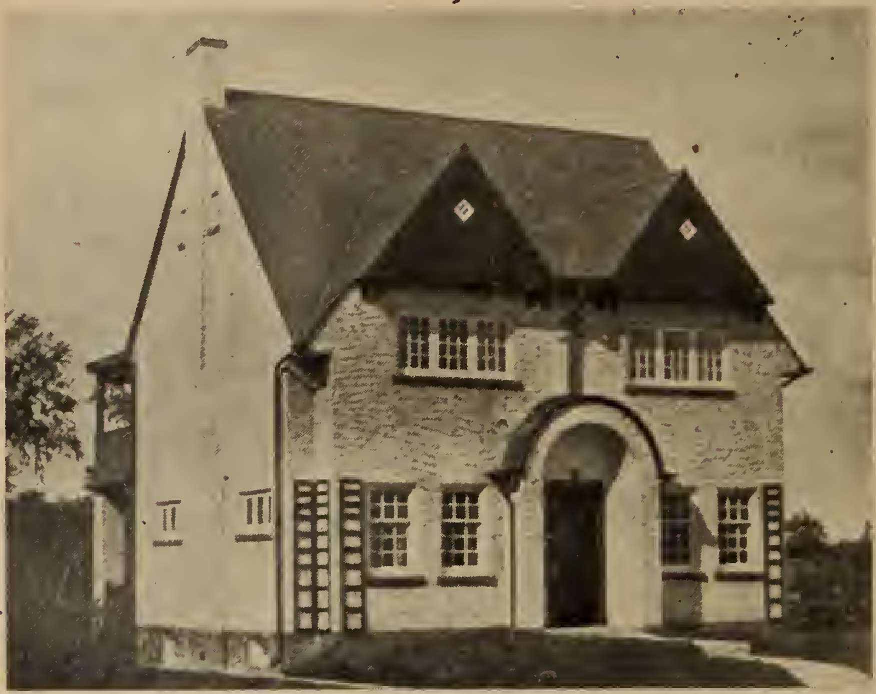
siderable raw material and finished product at certain times during the year, the facilities for such storage must be provided.

As a concrete illustration of the advantage of operating a block plant through the year as against closing down during the winter, the committee has worked out Figs. 2 and 3, the first representing a small, and the second a medium-sized plant.

These comparisons show only the bare figures, or the tangible quantities, but there are other factors worth perhaps even greater consideration. Men prefer permanent positions and steady work rather than temporary positions and intermittent work. Therefore, the manufacturer who provides his men steady employment can get the best men and mold them into an efficient and loyal organization which will effect economies that cannot be duplicated under the temporary employment system.

Trade Incorporation

The B. Greening Wire Company of Hamilton has been granted a Dominion charter, with an authorized capitalization of $1,300,000.

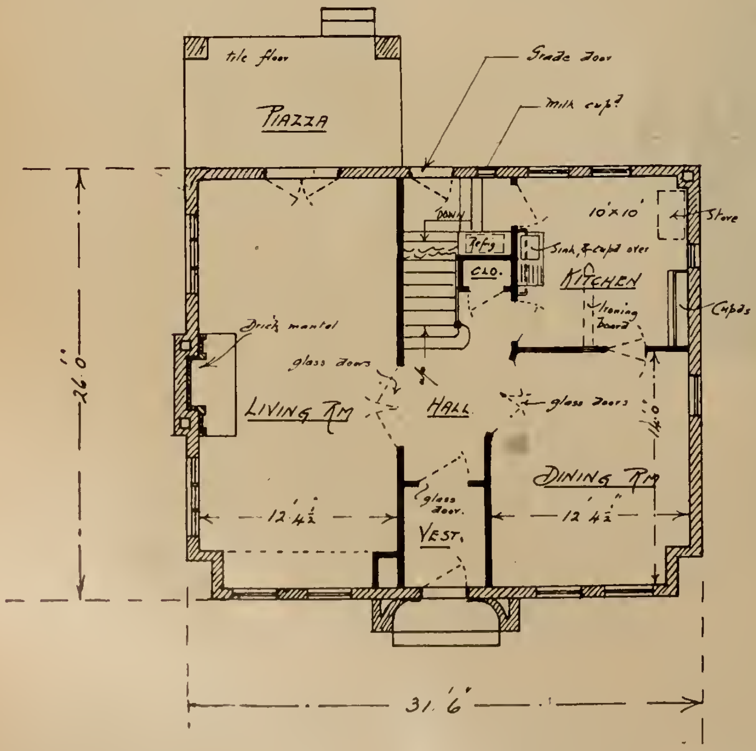


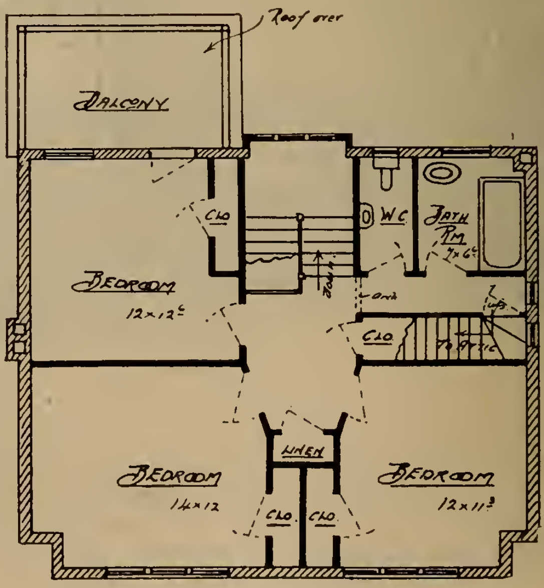
The Contract Record's Weekly House Suggestion No. 82

Our subject this week was designed by Messrs. J. Hunt Stanford & Son, architects, of 67 Yonge St. Arcade, Toronto, for Messrs. J. T. and H. Hutson and erected on the north side of Westmount Drive in this city. The cost was $9,750.

The exterior construction is of hollow tile, with plastered surface of "Pozzo" finished rough. The roof is shingled and the gables at the front are faced with sawn feather-edge boarding, stained a dark brown. The interior trim is as follows: Living room, in figured gumwood, walnut finish; hall, in oak with Old English staining; bedrooms, in pine, white enamelled. Flooring throughout is of oak. The floors and walls of the bathroom and W. C. are of tile and the bathroom also contains built-in bath and pedestal basin. The attic contains maid's bedroom, bathroom and trunk room. The heating system is of the hot water type.

A study of the reproduced plan will reveal to the reader the many other excellent features of this well-planned, moderately-priced, better class home.





Mainly Constructional

East and West—From Coast to Coast

The building plans of the Separate School Board at Toronto have been halted by the failure of the Home Bank. The Board had $71,000 on deposit in the bank. Plans for new buildings were to be up for sanction at a recent meeting.

The city of Quebec will borrow $780,000 to meet the cost of permanent works and the various constructions and improvements at the Exhibition Grounds. The loan was authorized by the Provincial Legislature at the last session.

Building figures for the month of August at Toronto were slightly over $2,000,000, which is about $1,000,000 less than the figure for the same month last year. City officials explain that building started so early here that an early fall slump is also to be expected.

Building permits issued at Oshawa, Ont., from the first of the year to the end of August amount to $1,367,655, exceeding the total for all last year by $173,435. The figures for August include the new unit of the General Motors plant, valued at $100,000.

The route which the new transmission line down the St. John Valley will take from Bridgewater, Me., to Woodstock, N.B.,has been definitely fixed. It will go from Bridgewater to Centreville, N.B., and then direct to Woodstock, by way of Williamstown Road; branch lines will be built from Farmerston to Hartland, 6 miles, and from Centreville to Bristol, 8 miles.

The Port Credit Brick Company Ltd., have recommenced the manufacture of red pressed brick at their plant at Port Credit, Ont. The Toronto office of this company is located at the foot of Jarvis St.

Moulding sand of a fine quality has been discovered in abundance on the farm of Sergeant Ross Cook, in the Township of Charlotteville, Ont., about three miles southwest of Simcoe. Excavations revealed veins varying in depth and width, running here and there just beneath the ground surface throughout practically the entire six acres of land. Mr. Cook brought samples to the West and Peachey foundry and this firm dispelled all doubt as to its value by giving him an order for immediate delivery of several tons of the heavier sand. A great quantity of finer quality sand has been located and Mr. Cook has taken several samples for inspection by Brantford firms.

A large public meeting at Durham, Ont., recently approved of a plan submitted by a firm of consulting engineers for a new water supply system for the town. Three sources of supply were suggested, namely local springs, the Saugeen River and Wilder's Lake. The first source was considered the best to adopt and also figured out the cheapest to develop, the cost being estimated by the engineers at $102,000, compared with $117,000 and $156,000 respectively for the Saugeen River and Wilder's Lake schemes.

A building permit for the new 2,000,000-bushel grain elevator to be erected adjacent to the new Government dock at Vancouver, B.C., by the Board of Harbor Commissioners, has been granted by the city. The structure cost $1,200,000. It is estimated that it will take at least four months to complete the structure.

Luney Bros. of Victoria, B.C., will build the new Canadian Pacific marine terminal buildings here, it was announced recently by Captain J. W. Troup, manager of the British Columbia coast steamship service. The building, it is stated, will take about ten months to complete, the cost of construction being approximately $155,000.

The sale of $49,000 debentures by the city of Sault Ste. Marie, Ont., to finance the construction of a fire hall here is being held up until the by-law has been validated by the Ontario Legislature. The by-law was passed and arrangements made for the purchase of the bonds, which are of the 30-year type, and it now appears that fire hall debentures must not be for a longer period than 20 years.

It is reported that work is to be resumed on the big $2,500,000 C.P.R. pier at Vancouver. Work was suspended owing to unstable labor conditions and the fluctuation of material costs, but as conditions have improved in the labor and supply markets, it is likely that a new start will be made on the work very soon. It will be a double deck pier with wharfage facilities on either side, equipped with the most modern crane devices for rapid loading and unloading of cargoes.

At a meeting of the executive of the Ontario Town Planning and Housing Association, held in the City Hall at Toronto recently, it was decided to hold the next Provincial Town Planning and Housing Conference during the last week of November. Municipal councils town planning and housing bodies, business, labor and social service organizations will be invited to send delegates. Important educational work is being planned for the Conference, but the important subject for consideration will be the securing of adequate town planning and housing legislation for Ontario.

Personal

Mr. R. H. Gale has been elected president of the Good Roads League of British Columbia.

Mr. Louis Parent, city architect of Montreal, has resigned, after a period of nine years in the city's employ.

Mr. John F. Hansen, president of the Terminal Cities Construction Co., has come to Toronto to take charge of a housing development at Leaside, to involve an expenditure of $150,000. The houses will be workingmen's dwellings of the moderate priced type.

Mr. C. E. W. Dodwell, district engineer of the Dominion Public Works Department at Halifax, has been promoted by the Civil Service Commission to the position of Superintending Engineer of the Maritime Provinces. His new duties will be largely in a consulting capacity. Mr. Thos. Locke, assistant engineer, has been promoted to Mr. Dodwell's old position.

Mr. C. E. W. Dodwell

CONSTRUCTIONAL ACTIVITY

Period of Sept. 5 to Sept. 11, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Alice Arm, B. C.

The Dept. of Public Works, Victoria, B. C., will start at once extending wing dam on Kitsault River costing $5,000 The district engineer is R. M. Taylor, Atlin, B. C.

Cochrane, Ont.

Work is to start shortly on $25,000 sewage disposal plant and sewers. This work will be done by day labor under supervision of engineer, who buys all materials.

Ford, Ont.

The Ontario Board of Health Department have approved the plans of the Essex Border Utilities Commission for a filtration plant which will have sufficient capacity to serve all the Border Municipalities. Tenders for the work will be called in November.

Kentville, N. S.

The town is at work doubling capacity of their reservoir. The work is under the supervision of J. R. Neville, town engineer.

Niagara Falls, Ont.

Tenders are being received till September 17 by T. S. Scott, clerk, for sewer excavation.

Uxbridge, Ont.

A by-law may be submitted to the ratepayers next January for a water supply and sewage disposal system.

Windsor, Ont.

The city council contemplate the laying of a sewer on Janette Ave., from Pine St. to northerly limit.

The city council contemplate laying sewers in Greenwood Park sub-division.

CONTRACTS AWARDED

Belleville, Ont.

The city council has awarded the following contracts in connection with $300,000 addition to waterworks system; steel intake pipe—Canadian Des Moines Steel Co., Chatham, Ont., at $14,722; substructure etc.—Randolph MacDonald Co., Ltd., Toronto, at $39,748; mechanically operated screens—Link Belt Co. Ltd., Toronto, at $3, 476; hydraulic valves—Drummond McCall & Co. Ltd., Toronto, at $887.50.

Blind River, Ont.

The town council has awarded the contract for concrete sidewalks to A. McNabb, 515 Wellington St. East, Sault Ste Marie, Ont.

Cranbrook, B. C.

The contract for road diversions cost- $12,000 on the Golden-Cranbrook Road, has been awarded to D. B. Griffin & Co., 739 Hasings St., W. Vancouver.

Drumheller, Alta.

The town council has awarded the following contracts in connection with new sewerage works; Thos Jackson & Sons & F. S. Fowler, construction of works, $39,538.75; Gormans Limited, sewer pipe, $10,402.18; cast iron pipe and fittings—Empire Water Works Supply Co. Ltd., $421.70, and Manitoba Bridge & Iron Works, Ltd., $1,234.23. sewer iron work —Riverside Iron Works, $1,350.90, Union Iron & Foundry Ltd., $614.80; Manitoba Bridge & Iron Works, Ltd., $249.10; wood pipe—Pacific Coast Pipe Co., $776.20; valves etc., Empire Waterworks Supply Co., Ltd., $154.04. Messrs. Haddin & Miles, Ltd., are the consulting engineers.

Essex County, Ont.

Messrs, Merlo, Merlo & Ray, Ford, Ont., have received the contract for concrete pavements costing $40,504.

Glace Bay, N. S.

The town council has awarded the contract for sewers to Harroty & Bianco, Halifax, N. S.

Mersea Twp., Ont.

The town council has awarded the contract for a mile of concrete pavement to the Chick Contracting Co. Ltd., Windsor, Ont.

Port Dover, Ont.

The town council has awarded the contract for macadam road to The Paving & Mastic Co. Ltd., Simcoe, Ont.

Petrolia, Ont.

The town council has awarded B. Kettle the contract for grading and gravelling Eureka St., from Main St., work will start in about ten days.

Province of Quebec.

Contracts for refection of roads have been awarded as follows; Parish of St. Louis de Gouzouge, Co. Beauharnois $4,23429—Hermenegilde St. Pierre & Magloire, Theory, Valleyfield, Que.; Parish of St. Joseph de Soulanges $359.-65—Kennedy Construction Co., Montreal; Hinchinbrook Twp., north part $5,321.80, south part $5,995, one mile south of Hinchinbrook Twp. $6,468, limits of province, Hinchbrook Twp. $12,566.40, Road of the river to Dewittville $9,921.60—O'Connor Bros., Huntington.

The following contracts for refection of roads have been awarded: Godmanchester Twp., $9,187.86, Ridge road $14,-560.80, 5th and 6th ranks $5,031.40—O'Connor Bros., Huntington; St. Joachim de Chateaguay $4,876.15,—Kennedy Construction Co. Ltd., Montreal; St. Stanislas de Kosta, $5,410.27—Hermenegilde Lapierre & Magloire Theoret, Valleyfield, Que.

The contract for gravel roads has been awarded as follows: Thurso $13,143.15, Lochaber and Gore townships $56,093—Peter Dent, Sainte-Sixte, Co. Papineau.

Seaforth, Ont.

The town council has awarded the contract for waterworks extension to Messrs. Day Bros.

Springside, Sask.

The contract for roadwork 9 miles west to cost $10,000 has been awarded to J. S. McIntosh, Nokomis, Sask.

St. Anne de Sabrevoix, Que.

The contract for macadam pavement has been awarded to Louis Zuanetti, Pointe A' Pic, Co. Charlevoix—St. George Rank $20,204.54, St. Michel Rank $13.385.66.

St. Andrews, Man.

B. McKay, Melrose, Man., and M. Twendun, Whytewold, Man., have the contract for roadwork costing $8,030.

Toronto, Ont.

The city of Toronto has awarded the contract to Warren Bituminous Paving Co. of Ontario Ltd., for bitulithic pavements on the following streets: Gillard Ave. $5,321—Kelvin Ave. $6,902—Luttrell Ave. $4,966—Jane St. $103,723—Warren Rd. $7,257.

The city of Toronto has awarded the following contracts for asphalt pavement: Glenfern Ave., $3,645; Godfrey Ave., $4,594; Hilton Ave. $4,192; Walpole Ave. $6,399 and North Place $2,170 to Commissioner of Works. Fairford Ave. to Contracting & Paving Co. Ltd., at $14,504. Gledhill Ave. not yet let.

Winnipeg, Man.

Macaw & MacDonald, Paris Bldg., Winnipeg, are the general contractors for concrete pipe tunnels to cost $8,975 in the Fort Osborne Barracks.

Yorkton, Sask.

Watters & Neelin, Yorkton, Sask., are the general contractors for roadwork to cost $14,000 from Yorkton north eight miles.

Railroads, Bridges and Wharves

Burlington Centre, N. S.

Tenders are being received by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., till September 19, for extension to wharf. Plans and specifications at Dept. office of Dist. engineer, Bellevue Building, Halifax, and at post office, Centre Burlington, N. S.

Bromptonville, Que.

Tenders will be called shortly by the town council for the steelwork only for a $10,300 bridge.

Burlington, Ont.

Tenders are being received till September 27 by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for reconstruction of south pier in Burlington Channel, consisting of construction of a retaining wall 489 ft. long. Plans and specifications at Dept. Offices of Dist. Engineers, Equity Bldg., Toronto, Ont., and Post Office, Burlington.

Dover Twp., Ont.

Tenders are being received by engineer, W. G. McGeorge, Chatham, Ont., till September 15 for erection of a 3 steel pile trustle bridge, length 90 ft. Plans and specifications with engineer.

Grassmere, Ont.

Tenders for the erection of a wharf are being received till September 21 by R. C. Desrochers, secretary, Parliament Buildings, Ottawa. Plans and specifications at Dept. office of dist. engineer, Equity Building, Toronto, and at post office, Grassmere, Ont.

Harrop, B. C.

The Department of Public Works will receive tenders till October 2nd, through the secretary R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of a public floating wharf. Plans and specifications with the Dept. of Public Works, Ottawa, Ont.

Pelee Island, Ont.

The Department of Public Works will receive tenders till September 25, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa for extension to Western wharf. Plans and specifications at Dept. Offices of Dist. Engineers. Royal Bank Building, London; Equity Bldg., Toronto and Post Office, Pelee Island.

Port Renfrew, B. C.

Tenders will be received by the secretary, R. C. Desrochers, Department of Public Works, Ottawa, till September 27 for the construction of wharf and repairs to approach. Plans and specifications with the Dept. of Public Works, Ottawa, Ont.

Repentigny, Que.

Tenders are being received by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., till September 21 for improvements to wharf approach at Repentigny. Plans and specifications at department offices of Dist. Engineers, Shaughnessy Bldg., Montreal, Post Office Bldg., Quebec, Que., and Post Office, Repentigny, Que

St. Prosper, Que.

Tenders are being received by Norbert Samson, secretary, till October 1 for the construction of an iron bridge.

St. Sulpice, Que.

Tenders are being received till September 21 by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for reconstruction of wharf approach at St. Sulpice. Plans and specifications at Dept. Offices of Dist. Engineers, Shaughnessy Bldg., Montreal, Que., Post Office Bldg., Quebec, Que., and Post Office, St. Sulpice, Que.

St. Michel D.Yamaska, Que.

Tenders are being received by secretary, N. St. Germain, Yamaska East, Que., for reinforced concrete bridge, 35 ft. long. No closing date set.

Windsor, N. S.

Tenders will be received by secretary, R. C. Desrochers, Parliament Buildings, Ottawa, Ont., till September 24 for the construction of a wharf. Plans and specifications at department office of district engineer, Bellevue Building, Halifax, and post office, Windsor, N. S.

CONTRACTS AWARDED

Hilliardton, Ont.

The contract for steel work of bridge over White River has been awarded to the Canadian Bridge Co. Ltd., Walkerville, Ont.

Normanby Twp., Ont.

The township council has awarded the general contract for 2 girder bridges to the Stratford Bridge Co., Stratford, Ont., at $3,590.

St. Marc, Que.

The town council has awarded the contract for $4,500 concrete and steel bridge to Lionel Robert, St. Marc, Que.

Public Buildings, Churches and Schools

Bengough, Sask.

Tenders will be received by the secretary-treasurer, Bengough, Sask., for the building of a $6,500 school. No closing date set. Plans and specifications with secretary-treasurer.

Gaspe, Que.

Pierre Levesque, architect, 115 St. John St., Quebec, Que., is preparing plans for a $100,000 Normal school to be erected at Gaspe, Que., for the Ursulines Sisters, Rimouski, Que. Work will start next Spring.

Ottawa, Ont.

Tenders are being received by clerk N. H. H. Lett, till September 13 for a $40,000 fire station. Separate tenders or bulk, except plumbing and heating. Plans and specifications with the architects, Millson, Burgess & Hazelgrove, 185 Sparks St., Ottawa.

Pierreville, Que.

Tenders are being received till September 21 by the Department of Public Works through the secretary, R. C. Desrochers, Parliament Buildings, Ottawa, Ont. Plans and specifications at Dept. of Asst. mechanical engineer, Dom. Public Works Bldg., Montreal, and the caretaker, Public Bldg., Pierreville, Que.

Port Burwell, Ont.

Norman A. Kearns, architect, Welland, Ont., is preparing plans for a $30,000 school.

Riviere Du Loup, Que.

Pierre Levesque, 115 St. John St., Quebec, is preparing plans for $20,000 school; 2 storeys, 54 x 64, brick construction.

Sault Ste. Marie, Ont.

Findlay & Foulis, architects, 527 Queen St. E., are preparing plans for an $8,000 Sunday school for the Bruce Hill Union Sunday School. Tenders will shortly be called by the architects.

Thorold, Ont.

Plans and specifications in connection with $60,000 school contemplated, are with MacLean Building Reports Limited, 345 Adelaide St. W., Toronto, Ont.

Toronto, Ont.

Separate tenders are being received by Rev. F. A. Nourse, 24 Nurse Wood Road, for a church basement for the Methodist church, north Danforth, Grove, near Ford factory. No closing date set. Plans and specifications with pastor.

CONTRACTS AWARDED

Edmonton, Alta.

The following contracts have been awarded in connection with $11,750 boiler house for the Royal Alexandria Hospital; general contractor H. G. MacDonald; plumbing and heating—Standard Plumbing & Heating, $424.00; electric—Carey Electric Co., $1,440. All of Edmonton.

Fredericton, N. B.

B. Mooney & Sons, 112 Queen St., have the general contract for a $125,000 memorial building to be erected for the University of New Brunswick.

Fairbank, Ont.

The following trades have been let on addition to Memorial school steel sash—Canadian Metal Window & Steel Products Ltd., 160 River St.; lath and plastering—H. W. Taylor, 18 Havelock St.; painting and glazing—H. Burroughs, 101 King West; terrazzo—Italian Mosiac & Tile Co., 429 Spadina Ave.; roofing and tinsmithing—E. Lankin & Son Ltd.; heating and plumbing—Bennett & Wright Co.. electric—J. B. Forsey, 159 Wychwood Ave.; telephones— Canadian Independent Telephone Co. Ltd.. tile—National Fire Proofing Co. of Canada. Ltd. All of Toronto.

Glenavon, Sask.

Waterman, Waterbury Mfg. Co. Ltd., Regina, Sask., have the general contract in connection with addition to school costing $10,500.

Hamilton, Ont.

The following sub-trades have been let in connection with addition to school costing $30,000 on George St.; plumbing and heating—Bloom & Brittain, 121 James St. S.; electric—W. C.Reid, Charlton Ave.; plastering—Hannaford Bros., 232 Robinson St.

Hanover, Ont.

The following contracts have been awarded in connection with $60,000 high school; C. H. Thedorf—general contractor; carpentry and plastering—Henry Spiesz : roofing, electric, plumbing and heating— Ross & Sutherland.

The following sub-trades have been let in connection with $20,000 school being built: masonry—J. W. Faelker; carpentry—Henry Spiesz. Tenders will shortly be called on roofing, electric, plumbing, heating and painting.

Kitchener, Ont.

The following contracts have been awarded on $440,000 hospital being built; steel—Hamilton Bridge Co. Ltd., Hamilton reinforced steel—Trussed Concrete Steel Co. of Canada, Ltd., Toronto; steel bars and ornamental iron—Roelofson Elevator Works, Galt, Ont.

Magrath, Alta.

L. D. S. Church, 2nd Ave., West, is the general contractor for a $16,000 church being built.

Mount Rolland, Que.

The following sub-trades have been let on $33,000 school being built. steel beams—Phoenix Bridge & Iron Works

Co. Ltd.; millwork—Geo. Lebel, 201 Baby St.; roofing and plumbing—Turcot Ltd., 1681 Clarke St.; electric—J. A. St. Amour, St. Denis St. All of Montreal. Brickwork by day labor.

Montreal, Que.

Ulric Boileau Ltd., 568 Garnier St., has the general contract for $90,000 hospital at 121 St. Hubert St.; cut stone—A. Cousineau, 2455 St. Urbain. No materials purchased. Tenders are wanted on all sub-trades.

The Walker Hardware, 252 St. James St., have the contract for tiling in connection with $200,000 church being built on Sherbrooke St. West.

Forgues & Guay, 407 Guy, have the contract for reinforced steel, and J. A. St. Amour, 2171 St. Denis, electrical work for $65,000 convent being built for the Sisters of Immacuile Conception.

North York Twp., Ont.

The following trades have been let on $5,925 school being built; electric—Porter & Clark, 2603 Yonge St., Toronto; heating—Leslie Bros., 329 Coxwell Ave., Toronto; painting—Joe. Smith, Stop 9, Willowdale, Ont.

North Cobalt, Ont.

Joe Van Rassell, North Cobalt, has been awarded the contract for building of school for the Separate School Board.

Ottawa, Ont.

H. Dagenais, 158 St. Patrick St., has the general contract for addition to school on Murray St., to cost $18,000.

The following sub-trades have been let in connection with $2,500,000 hospital being built at Carling and Parkdale Aves., roofing—McFarlane & Douglas; plastering—Murphy & Marrow; painting and glazing—Ritchie & Nun; plumbing—Garth Co. Ltd.; sheet metal—McKinley & Northwood; tile and marble—Italian Mosiac & Marble Co. Ltd., Toronto; electric—P. E. Marcand.

Point Grey, B. C.

E. J. Ryan Contracting Co. Ltd., Vancouver, have the contract for excavations and foundations in connection with $350,000 University Library.

Quebec, Que.

The contract for excavations and foundations in connection with Forestry school on St. Foy Road, has been awarded to C. N. Paradis Limited, 51 Bouffard St., at $45,000.

St. Anne de Bellevue, Que.

The contract for boilers in connection with alterations to Military Hospital, has been awarded to Waterous Engine Co., Brantford, Ont. Balance of work day labor.

St. Johns, Que.

The following sub trades have been let on alterations to church; masonry, carpentry and millwork— Alfred Pion, 70 St. James St.; roofing—J. E. Blanchard & Fils, 2133 St. Lawrence Blvd. electric—W. Rochon, 454 Lafontaine Park. All of Montreal.

Sudbury, Ont.

H. D. Evans, 272 College St., Sudbury, has the general contract for $12,000 addition to Baptist church.

Verdun, Que.

The following sub-trades have been let on $50,000 addition to church, corner Wellington and Gordon Ave.; masonry—Jas. Shearer & Co., 325 St. Patrick St.; millwork—Daniel Cream, 953 St. James St.; plumbing—John Gordon, 301 St. Antoine; plastering—C. Hayward, 226 Regent.

Valois, Que.

The following sub-trades have been let on $35,000 school being built; electric—R. Richard, Ste. Anne de Bellevue, Que.; plumbing and heating—O. F. MacCoffery, St. Anne de Bellevue; millwork— J. P. Dupuis Ltd., Verdun, Que.

Vancouver, B. C.

Work is to start at once on $4,500 gymnasium to be built for the Grace Methodist Church. Keir & McCormack, Vancouver, have the general contract.

Viceroy, Sask.

W. C. Turner, Viceroy, Sask., has the general contract for $6,500 school.

Windsor, Ont.

The following sub-trades have been let in connection with $160,000 separate school being built on Campbell Ave., painting—Wm. Russell, 1042 Highland Ave.; glazing—Long & Wilson, Walkerville. Terrazzo, mastic and plastering to be let.

Winnipeg, Man.

The fllowing contracts have been awarded in connection with power house and laundry for Grace Hospital; general contract— Wallace & Aikins, Ltd., $32,993; plumbing and heating—Bowker-Boag, Ltd., $14,938; electric—Star Electric Co., $2,990. All of Winnipeg.

Cotter Bros., Ltd., Fort St., Winnipeg, have the general contract for alterations to heating system in Immigration building, to cost $12,987.

Business Buildings and Industrial Plants

Edmonton, Alta.

The Alberta Granite & Marble Works, Edmonton, are having plans prepared for a $10,000 factory corner 101st and 107 Sts.

Ford, Ont.

New tenders are being received, no closing date set, for a $45,000 bank to be built corner Charles St. and Drouillard Rd. for the Provincial Bank of Canada. G. J. P. Jacques, 3 Ouelette Ave., Windsor, Ont., is the architect.

Hamilton, Ont.

Plans are to be revised and new tenders will shortly be called in connection with foundry building for the Canadian Westinghouse Co., on Aberdeen St., W.

Montreal, Que.

Jas Strachan Ltd., 246 City Hall Ave., contemplates an extension to bakery on City Hall Ave. Sydney Comber, 127 Stanley St., is the architect.

New Westminster, B. C.

The B. C. Berry Grower's Union, New Westminster, contemplate building a cold storage plant at a cost of $75,000.

Port Colborne, Ont.

Tenders are being received by the secretary J. W. Pugsley Parliament Buildings, Ottawa, Ont., till September 20 for storage annex to elevator. Plans and specifications at Offices of chief engineer, Ottawa, superintending engineer, Welland Canal, St. Catharines, Ont.

Quebec, Que.

The foundations are in for a $7,000 store on St. Valier St. Martin Madde, 821 St. Valier St., is the owner. Work by day labor.

St. Catharines, Ont.

Tenders are being received till September 15, by general superintendent, E. W. Oliver, 1 Toronto St., Toronto, for the general contract in connection with T. N. & St. C. Rly. terminal building. Robertson Construction & Engineering Co., Niagara Falls, Ont., are submitting a bulk tender and want prices on sub-trades.

Toronto, Ont.

The following general contractors are submitting tenders and want prices on all sub-trades in connection with Y.W. C. A. Headquarters to be built on McGill St.; Jackson, Lewis Co. Ltd., Ryrie Bldg.; Dickie Construction Co. Ltd., Ryrie Bldg.; Jas. Sims, 372 Markham St.; J. Robert Page, 18 Toronto St.; Anglin-Norcross Ltd., Temple Bldg.; J. D. Young & Son, 835 College St.. H. A. Wickett & Co. Ltd., 127 Front East; Bennett & Crews, 700 Dufferin St.; Sullivan & Fried, 81 Victoria St. All of Toronto.

Vancouver, B. C.

Plans are being prepared for a Y.W. C.A. Gymnasium to cost $30,000. McCarter & Nairne, 710 Northwest Bldg., Winnipeg, Man., are the architects.

Vegreville, Alta.

The foundations are going in for stores and theatre costing $15,000. Chas. Gordon, Vegreville, Alta., has the general contract.

CONTRACTS AWARDED

Collingwood, Ont.

D. Bell, Collingwood, Ont., has the general contract for the erection of a factory for the Canadian Postal Lock-Nut & Bolt Co. The following sub-trades have been let; masonry—Albert Dillon; carpentry—D. A. Bell; plumbing—Parrot Bros.

Hamilton, Ont.

H. Gummo, 447 Aberdeen Ave., has the contract for masonry and concrete work, and Wm. Boyle, Price St., the carpentry work, in connection with market (8 stores) being built corner Ottawa and Barton Sts. Balance of sub-trades to be let by the owner, W. J. Loard, James St. North.

Leaside, Ont.

James Gordon, 885 Broadview Ave., has the general contract, and Jno. W. Oram, 836 Yonge St., the contract for plumbing and heating in connection with $20,000 bank to be built for Imperial Bank of Canada. General contractor wants prices on all materials.

Montreal, Que.

The Harbor Commission has awarded the general contract for $125,000 office building on Victoria Pier to Collet & Freres, 243 St. Hubert St.

The contract for roofing $40,000 machine shop being built for the Harbor Commission, has been awarded to Douglas Bros. Co. Ltd., 10 Benoit St.

The following sub-trades have been let on $1,000,000 office building being erected on Bleury St.: reinforced concrete superstructure—O. Archambault, 610 Lafontaine Park; electric— Canadian Comstock Co. Ltd., 10 Cathcart St.

P. S. Hudson, 271 Mountain St., has the contract for millwork in connection with $25,000 molasses distillery being built at 1706 Notre Dame St. E. Heating, painting and glazing trades to be let.

The following sub-trades have been let in connection with marine tower jetty and transit sheds being built for the Harbor Commissioners; reinforcing steel —Trussed Concrete Steel Co.; roofing, metal sash, kalemein doors and rolling doors—Metal Shingle & Siding Co. Ltd.; electric—Phillip Lahee & Co.; plumbing and heating—T. O'Connell; turn over doors—F. Bacon & Co., at $38,000. Painting and glazing to be let.

Merritt, B. C.

Work is to start at once on $12,000 bank building to be built for the Bank of Toronto. The general contract has been awarded to Frederick Davies, Carter Cotton Bldg., Vancouver, B. C.

Middleton, N. S.

Cooperage of Canada, Ltd., Hamilton, Ont., are erecting a cement block cobeing supplied by Middleton Cement Products Co. Ltd.

Nelson, B. C.

Work is to start at once on a $30,000 Masonic Temple, John Burns & Son have the general contract ; electric—Bennetts Ltd.; plumbing and heating—B. C. Plumbing & Heating Co. All of Nelson, B. C. Plastering and painting trades not yet let.

Oliver, B. C.

N. A. Clark and D. C. Fromey, Penticton, B. C., have the general contract for $15,950 government offices to be built. No materials purchased.

St. Catharines, Ont.

Plans are to be prepared for a $400,000 paper mill for the Garden City Paper Co., Merriton, Ont. W. J. Trimble, 54 University Ave., Toronto, will be the engineer and general contractor.

Sangudo, Alta.

C. Visser, Sangudo, Alta., have the general contract for a $10,000 creamery to be built for P. Burns & Co., Edmonton, Alta.

Toronto, Ont.

The following contracts have been awarded in connection with the rebuilding of club house at Sunnyside; piling—John E. Russell Co. Ltd.; main slab reinforced concrete work—Ramsay Contracting Co.

The walls are now going up for $20,000 office building corner Dufferin and St. Clair Ave., west. The following subtrades have been let: masonry—Geo. H. Huckle, 18 McKay Ave.; carpentry—Shaw & Hamilton, 286 Nairn Ave.

Sullivan & Fried, 81 Victoria St., have been awarded the general contract for $150,000 subsidiary buildings to be built on Bathurst St. for the Toronto Transportation Commission.

The general contract for $40,000 office building corner Queen East and Connaught Ave., for the Toronto Transportation Commission, has been awarded to Witchall & Son, 156 St. Helens Ave.

The general contract for $175,000 office building to be erected corner Gerrard and Yonge Sts., has been awarded to P. H. Secord & Sons Construction Co. Ltd., Toronto; steel—McGregor & McIntyre Ltd., 1139 Shaw St. The general contractor will let balance of trades.

The contract for excavation work in connection with rebuilding of club house at Sunnyside, has been let to the Ontario Foundation Co. Ltd., 22 Watford Ave. Revised plans for boat and club house are in course of preparation for tenders.

Winnipeg, Man.

A. J. Bonnett & Bros. are the general contractors of a $5,000 drug store south east corner Broadway and Young, and want prices on millwork, roofing, sheet metal, plumbing, heating and painting and glazing trades. McDonald & Wilson Lighting Co., 309 Fort St., Winnipeg, have the contract for electrical work.

Carter-Halls-Aldinger Co., Union Bank Building, have the general contract in connection with addition to hotel on Smith St., at a cost of $20,000.

The contract for plumbing and heating in connection with $79,000 addition to bakery for Parnell Baking Co. Ltd., has been awarded to C. D. Kirk Co., Winnipeg, at $5,400.

Residences

Brighton Beach, Ont.

Tenders are being received by the owner, Gus Ante, Aldershot, Ont., no closing date set for the building of 4 residences, 1 storey, concrete block foundation, frame construction.

Chatham, N. B.

Tenders will be received till September 15 by H. W. Fliege, secretary, for the building of a manse for the United Presbyterian Church of St. Andrew and St. John. Plans and specifications with D. P. McLachlan, Chatham, N. B. Separate tenders for frame building and brick building.

Hamilton, Ont.

Work has just started on 2 residences being built on Huxley Ave. to cost $6,000. T. Casey, 37 Huxley Ave., is the owner and general contractor and will let sub-trades.

Jas. McNaught, 32 Rosslyn Ave. S., is the owner and general contractor of a $4,500 residence being built on Fairleigh St. S., and will let trades.

W. H. Yates Construction Co., 17 Main St. E., are the owners and general contractors of 2 residences, $9,000, being built on Delaware Ave.; 2 stories, brick construction.

Limoilou, Que.

Excavation work is being done for a 6 family residence on Canardiere St., costing $10,000. C. Albert Bouret, 125 Fifth St., is the owner. Work by day labor.

Montreal, Que.

The foundations are now going in for a residence on Lagauchetiere St., to cost $10,000. H. Pauquin, 107 Visitation, is the owner and builder.

The foundations are going in for 2 residences to cost $7,000 on Berri St., between 33rd and 34th Aves. L. Dolbec, 3399 St. Denis is the owner, and buys materials.

Manseau & Beaulier, 375 Westhill, are the owners and builders of 6 residences to cost $60,000. No material purchased. Heating, plastering and tiling trades to be let.

R. Senecal, 188 Cuvillier, is the owner and builder of 2 residences to cost $12,000 on Stadacona, between Davidson and Darling; 3 stories, 28 x 36, frame and brick construction. Roofing, plumbing, brickwork and plastering to be let.

Plans are being prepared for a ten storey apartment hotel on Mountain St. R. Charbonneau, 194 G. E. Cartier Square, is the architect in charge.

A. Martel, 1643 Delanaudiere, is the owner and builder of the $5,000 residence on Chambord St.; 2 stories, 25 x 68, frame and brick construction. Brickwork, roofing, electric, plumbing and plastering trades to be let.

D. Menard, 62 Garnier St., is the owner and builder of 2 residences on Marie Anne, to cost $12,000. Masonry, millwork, roofing, electric, plumbing and plastering trades to be let.

Nelson, B. C.

F. Guimot, Benson St., is the owner and builder of a $3,100 residence on Benson St. 1 storey, 26 x 40, frame construction. Electric, plumbing, heating and plastering trades not yet let.

Ottawa, Ont.

Caleb Brooks, 590 Driveway, contemplates building a $7,000 residence on Broadway; 2½ stories, 30 x 38, brick veneer construction.

Jas. Dillon, 147 Holland St., is the owner and general contractor of a $4,000 residence on Holland St.; 2½ stories, 20 x 26, brick veneer construction.

J. C. Thoms, 137 McLeod St., is the owner and general contractor of a $4,500 residence on Sunnyside St.; 2 stories, 27 x 38, stucco construction.

L. Maheux, 48 Catherine St., Clarkstown, is the owner and general contractor of a $5,000 residence on Douglas St. 2½ stories, 32 x 33, brick veneer construction.

Port Credit, Ont.

J. W. Fletcher, Streetsville, Ont., contemplates building an $8,000 store and residence on Toronto St.

Mr. Russell, Hiawatha Road, is the general contractor of a $6,000 residence on Hiawatha Road for E. Schofield. Heating, painting, plastering, electric and plumbing trades to be let.

Point Grey, B. C.

H. Gostick, 981—21st Ave. W., Vancouver, is the architect and general contractor of $3,000 residence being built at 984—16th Ave. W., for Mrs. M. Watson, 1150—7th Ave. W., Point Grey, B. C.

Quebec, Que.

Wilfrid Chamberland, 270 Kirouac

(Continued on page 52)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

City of Niagara Falls, Ont.

Sewer Pipe

Properly marked tenders will be received at the office of the City Clerk till noon,

September 17th, 1923,

for supply of 3,000 lin. feet of No. 1 Sanitary Sewer Pipe, 24 inch diameter vitrified or concrete.

T. S. SCOTT, City Manager.

Niagara Falls, Ont.
Sept. 5, 1923.
37

TENDERS

Thorold Public School

Bulk or separate tenders will be received by Mr. Frank M. Pew, Secretary Treasurer, c/o Nicholson & Macbeth, Architects, until five P. M.,

Monday, September 17th, 1923,

for all trades required in the erection and completion of an eight room school building for the Thorold Public School Board.

The lowest or any tender not necessarily accepted.

NICHOLSON & MACBETH, Architects,
46 Queen Street,
St. Catharines
36-37

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of south pier at Burlington Channel, Ont.," will be received at this office until 12 o'clock noon (daylight saving),

Thursday, September 27th, 1923,

for the reconstruction of the south pier, consisting in the construction of a retaining wall for a length of 489 feet, at Burlington Channel, County of Wentworth, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the office of the District Engineer, Equity Building, Toronto, Ont., and at the Post Office, Burlington, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p. c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 5, 1923.
37-38

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Bridges

TOWNSHIP OF DOVER

Sealed tenders will be received by the undersigned up till noon on

Saturday September 15th,

for the construction of three steel pile trestle bridges (length overall about ninety feet) on the Little Bear Creek Drain in the Township of D'over.

Plans and specifications and form of tender may be seen at the office of the undersigned Chatham, Ontario.

Tenders must be accompanied by marked cheque for at least five per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
Engineer, Chatham Twp.
36-37

Notice to Contractors

Sealed tenders marked "Tender for Contract No. 1015", will be received by the undersigned until 12 o'clock noon

Friday September 28th, 1923,

for the erection and placing of a stone filled timber crib around pier 12, and also such cribbing of a similar nature as may be required around the Pivot Pier on the Provincial Highway Bridge south of Belleville across the Bay of Quinte.

Further information, plans, specifications and tender forms may be obtained on and after Friday, September 14th, 1923, at the office of the undersigned and at the office of W. Noonan, Resident Engineer, Napanee.

A marked cheque for $500.00, payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to each tender. A Guaranty Company's contract bond for 50% of the amount of the tender will be furnished by contractor when contract is signed.

All bonds must be made out on Departmental Forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, September 7th, 1923.
37

Construction accountant seeks position—ten years experience construction and industrial work. Available immediately. Box 361, Contract Record, Toronto.
34-37

Tenders for Sewer Excavation

NIAGARA FALLS, ONT.

Tenders properly marked, will be received at the office of the City Clerk till noon,

Monday, September 17, 1923,

for approximately 2,900 lineal feet of trench from 6 to 9 feet deep by 4 feet wide. Payment to be made by the cubic yard. Particulars at office of City Manager.

T. S. SCOTT,
City Manager.
36-37

Department of Railways and Canals

Welland Canal
Storage Annex to Port Colborne Elevator

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Storage Annex to Port Colborne Elevator" will be received at this office until 12 o'clock noon on

Thursday, September 20, 1923.

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Welland Canal, St. Catharines, Ont.

Copies of plans and specifications may he obtained on payment of the sum of $50.00. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for a sum not less than ten per cent. (10%) of the Contractor's tender and made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Thursday, August 30, 1923.
36-37

For Sale

One 10 E. Austin Cube Mixer, traction wheels, in very good condition. Cash price reasonable. Chick Contracting Co. Ltd., Windsor, Ontario.
35-37

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f.
Niagara Falls

Tenders For Concrete Bridge

Sealed tenders addressed to N. L. Powell, County Engineer, Brampton, will be received up to 2 P.M. on

Wednesday, September 19th, 1923,

for supplying material and construction of 28 ft. span, reinforced cement concrete Bridge on road between the 1st and 2nd Concession N.D.S. opposite Lot No. 14, Township of Toronto.

Plans and specifications may be seen and forms of tender and all information of same at the offices of Mr. Powell or the undersigned.

The lowest or any tender not necessarily accepted.

WHEELOCK & CHRISTIE,
Civil Engineers,
Orangeville, Ont.

September 11th 37

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6′ 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3,000 pair Blankets.
Cookery Outfit.

Apply to Box 375, Contract Record Toronto. 37-38-39

Wanted at once—Reinforced Concrete Bridge Superintendent or General Foreman. Apply Box 379, Contract Record, Toronto. 37

Residences

(Continued from page 49)

St., is the owner of a 3 family residence to be built on Kirouac St. to cost $4,000. 2½ stories, 30 x 42, brick veneer construction. Work by day labor.

The foundations are in for a 3 family residence on Renaud Ave. to cost $6,000. 3½ stories, 30 x 35, brick veneer construction. Work by day labor. Alfred Robitaille, 149 Bayard St., is the owner.

Joseph Renaud, 108 St. Leon St., is the owner of a $7,000, 5 family residence being built on Marie de L'Incarnation St. Work day labor.

Regina, Sask.

Tenders will be received by the architects, Clemesha & Portnall, Credit Foncier Building, for the erection of 2 residences on Assiniboia Place; 1 storey and basement, 26 x 33, frame and stucco construction. No. closing date set.

Sandwich, Ont.

P. Prince, Davis Building, is the owner and general contractor of a $12,000 residence on Partington Ave. Electric, plumbing, plastering and painting trades to be let.

Sydney, N. S.

Alex. McLeod, care Wm. Davies Co., Ltd., is the owner of a $4,000 cottage being built on Cottage Road. Work day labor by owner.

St. Lambert, Que.

Modern Housing Co., 631 Notre Dame Ave., Montreal South, are the owners and general contractors, of an $8,000 residence being built on Pine St. All sub-trades to be let.

St. Laurent, Que.

The foundations are going in for a $4,500 residence on College St. J. Hamelin, St. Laurent, is the owner and builder.

St. Martin, Que.

Jos. Baillargeon, is the owner and builder of a $7,000 residence; 2 stories, 35 x 35, frame construction.

St. Catharines, Ont.

Walter Goffin, 98 Chaplin Ave., contemplates building a residence on Wolseley Ave. and will let all trades.

Sandwich, Ont.

E. J. Baby, 15 Park Place, is the owner and general contractor of a $10,000 duplex residence on west Partington Ave. Electric, plumbing and plastering trades to be let. No materials purchased.

St. Vital, Man.

G. E. Simonite, 902 McArthur Bldg., Winnipeg, Man., is the owner and builder of 3 residences on May St., to cost $1,800 each.

A. G. Siddle is the owner and builder of a $6,500 residence on St. Mary's Road; 1 storey, 26 x 40, frame and stucco construction.

Toronto, Ont.

Albert Lindsay, 163 High Park Ave., is the owner and builder of a $7,500 bungalow on east side Beresford Ave., near Colbeck Ave. Tenders are being received on plumbing, plastering, heating, electric and painting trades.

Work is to start shortly on 2 residences south side Baby Point Crescent near Humbercrest Drive. H. C. Roberts, 609 Federal Building, is the owner. No material purchased.

Tenders are being received on heating, electric, plumbing, painting and plastering trades for $9,500 bungalow and garage, south west corner Patterson and Glendale. Rich. Jones, 21 Maple Grove Ave., is the owner and builder.

H McSherry, 33 Glebeholme Blvd., is the owner and builder of 2 stores and apartments, $12,000 each, on north side Gerrard East, near Highland Blvd.; 2 stories and basement, 40 x 49, brick construction.

Wm. H. Patchell, 2364 Queen West, is the owner and builder of 2 residences on west side Nursewood Road, near Queen East, costing $5,000 each; 2 stories, 21 x 35 each, brick construction.

The excavating has started for 2 pair residences, $7,500 a pair, at 421-27 Jones Ave. Geo. Lankin, 43 Thorncliffe Ave., is the owner and builder, and employs regular staff and buys material.

A. Mundy, 1 Columbine Ave., is the owner and builder of 2 pair residences, $6,000 pair, at 44-50 Robbins Ave.; 2 stories, 32 x 36, shingle and brick construction.

Thos. W. White, 267 Balliol St., is the owner and general contractor of 4 residences, $3,000 each, east side Edith Drive, near Eglinton Ave. Plastering, painting, electric, plumbing, and heating to be let by owner.

The footings are in for 1 pair residences costing $7,000, on east side Roseheath Ave., near Danforth Ave. F. Stevens, 62 Gough Ave., is the owner and builder.

The foundations are going in for 1 pair residences costing $8,000, on west side Eighth Ave., near Gerrard E. W. C. Lock, 101 Glenmore Road, is the owner and builder.

G. B. Moore, 243 Wychwood Ave., is the owner and builder of 1 pair residences, $4,500 each, east side Mulberry Ave., near Earlsdale Ave. Electric, plastering, painting, plumbing and heating trades to be let.

Sam. Dicket, 121 Bowood Ave., is the owner and builder of a $5,000 residence south side Bowood Ave., near Hilda Ave. 2 stories, 21 x 34, brick construction.

W. G. Robinson, 990 Kingston Road is the owner and builder of 1 pair stores and apartments costing $7,000, north side Kingston Road near Kingswood Road; 2 stories, brick construction. Heating, plumbing, plastering, electric and painting to be let by owner.

Wm Law, 56 Innis Ave., is the owner and builder of 1 pair residences, $5,500 each, west side Ossington near Davenport Road; 2 stories, brick construction.

The excavating is being done for 1 pair residences, $6,000 each, on Keele St. Jno. M. Bentley, 517 Runnymede Road is the owner and builder. Heating, plumbing and electric trades to be let.

W. Wilson, 14 Normana Ave., is the owner and builder of a $6,000 residence on east side Winnett Ave., near Normana; 2 stories and basement, brick construction. Plastering, painting, heating, plumbing and electric trades to be let.

B. Scott, 37 Rockvale Ave., is the owner and builder of 1 pair residences, $4,500 each, on west side Lauder Ave., near Harris Ave. 2 stories, brick construction.

Harry Graham, 50 Fairview Ave., is the owner and builder of 5 bungalows, $6,000 each, north west corner Ardagh and Durie St., and wants prices on hardwood flooring, concrete and drains.

E. M. Hoare, 16 Hillsdale Ave. W., is the owner and builder of a $10,000 residence corner Dinnick Ave. and Weybourne Crescent; 2 stories, brick construction. Owner employs regular staff and buys material as required.

Chamberlain & Davis, 2 St. Clair Ave. E., are the owners and builders of 6 residences east side Lixie St., near Heath; 2 stories, 21 x 35, brick construction. Plastering, plumbing, heating and electric trades to be let by owner.

J. Bodie, 456 Pape Ave., is the owner and builder of 2 pair residences, $5,000 a pair, north side Sherwood Ave., near Yonge St.; 2 stories, 32 x 36, shingle and brick construction. Heating, painting, plastering, plumbing and electric trades to be let by owner.

F. Markham, 156 Alexandria Blvd., is the owner and builder of a $7,000 residence, north side Alexandria Boulevard; 2 stories, brick construction.

Ive & Loader, 112 Galt Ave., contemplate building 2 residences on Falcon Ave.; 2 stories, brick construction. No material purchased.

J. W. A. Crowe, 2a Glenwood Ave., is the owner and builder of 2 residences, $6,500 each, on Cornish Ave.; 2 stories, brick construction.

De Jonckhere & Reburn, 72 Ostend Ave., are the owners and builders of a $7,000 bungalow west side Brummell Ave., near Clinck. Electric, plastering, plumbing and heating trades to be let.

The footings are going in for a $6,000 bungalow, west side Pape Ave., near Don Mills Road. D. Mars, 803 Pape Ave., is the owner and builder.

Thos. Frankish, 1 Walnut Ave., is the owner and builder of 2 residences to cost $11,000, on east side Coxwell Ave., near Wolverleigh; 2 stories, 21 x 34, brick construction. Owner employs regular staff and buys material as required.

The walls are going up for 1 pair and 1 single residence to cost $10,000, south side Millwood Road, near McCord St. Max Zacks, 525 Palmerston Blvd., is the owner and builder and will let the plastering, painting, heating, plumbing and electric trades. Masonry work by day labor.

Sidney F. Lankin, 667 Pape is the owner and builder of 3 pair residences to cost $6,000, north side Bain Ave., near Logan Ave. Owner employs regular staff and buys material as required. Carpentry and masonry by day labor.

Westwater & Sharp, 158 Langford Ave., are the owners and builders of 3 residences to cost $3,500 and $8,000, west side Glenmount Park Road, near Burgess Ave. Masonry day labor. Plastering, painting, heating, plumbing and electric trades to be let by owner. 2 stories, 21 x 35, shingle and brick construction.

R. E. McDonbagh, 299 Huron St., is the owner and builder of a $6,000 residence, north side Glenrose Ave. 2 stories, brick construction. Heating, painting, plastering, plumbing and electric trades to be let by owner.

Vancouver, B. C.

McCarter & Nairne, architects, 709 Northwest Bldg., Vancouver, are preparing plans for a $200,000 apartment house. The owners are R. McNair & Associates, care of architects.

Verdun, Que.

Work is to start shortly on 20 flats to be built on Ballantyne, between 3rd and 4th Aves., at a cost of $60,000. Jos. Soucissee, 1384 Wellington, is the owner and builder. No materials purchased.

Windsor, Ont.

E. J. & R. Baby are the owners and general contractors of a four family apartment on Wyandotte St. to cost $12,000; 2 storeys, 26 x 55, tile and brick construction. Painting, plumbing electric and plastering to be let. No materials purchased.

W. Hales, Sandwich, Ont., is the owner and general contractor of 2 stores and flats on Wyandotte St. costing $8,000. Painting, electric, plumbing and plastering trades to be let,

E. J. Baby, 15 Park St., is the owner and general contractor of a $10,000 duplex residence on West Partington Ave. Two storeys, 24x 36, brick veneer construction. Electric, plumbing and plastering to be let. No materials purchased.

H. Hallett, architect, 15 Victoria Block, is preparing plans for a 24 family apartment to be built on Ouelette Ave.

Walkerville, Ont.

Pennington & Boyd, architects, Windsor, Ont., are preparing plans for an apartment house for the Walker Land & Building Co., Walkerville. 3 stories, 141'4" x 40'4" solid brick construction.

Winnipeg, Man.

Excavation work has started for an $8,000 residence south east corner Academy and Oxford Sts. W. A. Cameron, 765 Broadway, Winnipeg, is the owner. Sheet metal, electric, plastering and painting trades not yet let.

P. McDiarmid, 160 Vaughan St., is the owner and builder of a $4,000 residence east side Niagara, between Kingsway and Haskins; 1 storey, 28 x 36, frame construction.

A. A. Harris, 24 Hart Ave., Elmwood, Man., is the owner and builder of a $4,200 residence west side Sherburn, between Portage and Westminster; 1½ stories, 22 x 30, frame and stucco construction.

Harris Construction Co., 700 Lombard Bldg., Winnipeg, are the owners and builders of a $4,300 residence, south side Winnipeg Ave. 1 storey, 22 x 35, brick construction.

The foundations are going in for a $5,200 residence, north side Lansdowne, between Salter and Aikins Sts. Beggs & Foulkes, 539 Cathedral Ave., are the owners and builders.

CONTRACTS AWARDED

Beebe, Que.

L. Blondeau, Beebe, Que., is the general contractor for a $5,000 residence being built for Mr. Ar. Russell, Beebe, Que.

Chatham, Ont.

Frank Green has the general contract for the building of a $20,000 residence on King St, for Sydney Stephenson, 430 King St. 2½ storeys, 33 x 70, brick veneer construction.

Collingwood, Ont.

Hugh Shaw has the contract for millwork in connection with $4,500 residence being built on Maple St.

Calgary, Alta.

Baptie Bros., 114—19th Ave. N.E., have the general contract for a $7,500 residence on Royal Ave. to be built for A. H. Mayland, 841 Royal Ave.

Humberstone, Ont.

The following sub-trades have been let on $4,000 residence being built on Thompson St.: plumbing—Wm. Trayner & Son, Humberstone, Ont.; plastering—Peter Beam, Port Colborne; electric—Jack Livingstone, Port Colborne, Ont.

The following sub-trades have been let on $5,000 residence being built on Cranberry St.: electric—Jack Livingstone; plumbing—Fred Kulow; plastering—Peter Beam. All of Port Colborne, Ont.

Hamilton, Ont.

E. Jones, 119 Rosslyn North, is the owner and general contractor of a $4,500 residence, north east corner Grosvenor and Justine Sts. 1 storey, brick construction. C. Havers, 127 Wentworth North, has the contract for plumbing.

The contract for masonry has been awarded to Wade & Engills, 294 King East, in connection with store and apartments on King St., East, near Walnut. Tenders are being received by the owners, Mills Bros, Imperial Building, on sub-trades.

Lachine, Que.

Fournier & Freres Ltd., have the general contract for 40 residences (80 flats) being built on various streets at a cost of $360,000, for the Metropolitan Housing Co.

Jas. Stormont, 210—5th Ave., is the general contractor for 2 stores and flats south east corner 8th Ave and Notre Dame, and will let sub-trades.

London, Ont.

E. C. De Potie, has received the contract for a complete hot water system for a double store and apartment on Wharnscliffe Road.

Montreal, Que.

J. Marcotte & Cie, 3117 St. Catherine East, has been awarded the general contract for a $60,000 residence to be built corner Robin and Amherst Sts. for Parish St. Catherine. Jos. Sawyer, 407 Guy St., is the architect. All sub-trades to be let.

The following sub-trades have been let on 2 residences being built corner Albany & Gatineau Sts.: masonry—Jos. Boule, 68 Viau; roofing, plumbing and heating—N. Bonneville, 828 Lacombe; electric—Briard & Houle, 837 Albany St.

A. Lefrancois, 123 Saguinet, has the general contract for $9,000 cottage being built on Beaubien St. for Dr. J. D. Vezinam 2518 St. Hubert.

L. Pelletier, 255 Cartier St., has the general contract for a $16,000 residence on Cartier, between Demontigny and Logan, for A. Breton, 428 Dorion.

A. & R. Billet, 6158 Peloquin, are the general contractors for 2 stores and 2 flats to cost $35,000 on Ste. Catherine and Maisonneuve, and will probably let sub-trades. No materials purchased.

The following sub-trades have been let on 3 residences on Marlow, near Sherbrooke St.: brickwork—A. Martineau, 28 Rielle; marble and tiling—H. Capra, 2795 Drolet; electric—Mr. Houle, 375 Westhill; plumbing and heating—J. E. Hardy, 1470 Papineau; plastering—J. O. Mantel, 593 Old Orchard. All of Montreal.

New Hamburg, Ont.

J. J. Berger is the owner and builder of a $7,000 residence. The following sub-trades have been let: masonry and plastering — H. Schultz; electric — Geo. Morley; plumbing—Geo. Steiner; heating—D. Becker; painting—J. Fisher; no materials purchased.

Nanaimo, B. C.

Stewart & Coltart, South Vancouver, are the general contractors for a $5,100

Tear Off and Mail the Coupon
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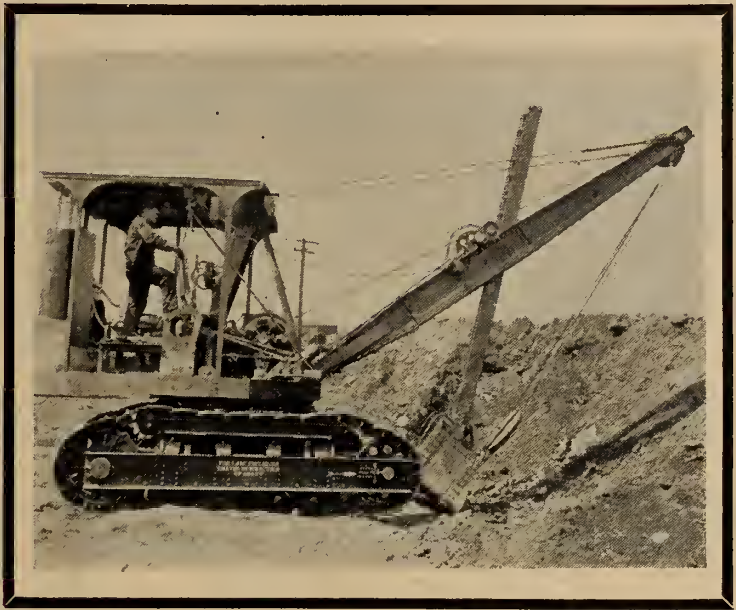
See New Machinery Section This Issue



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residence on Victoria Road for J. M. Galbraith.

Outremont, Que.

The following sub-trades have been let on $24,000 cottage being built on Holyroad: millwork Daniel Cream Ltd.; roofing — Richardson & Simard; tiling — Brown & Sons.

Ottawa, Ont.

The following sub-trades have been let on $7,000 residence being built on Broadway Ave.: plumbing and heating—H. Rennick, 95 Carruthers; electric—H. L. Allen, 272 Bank St.; plastering—Bowman Bros., 18 Thornton Ave.

The following sub-trades have been let on $5,000 residence being built on Riverdale Ave.: plumbing and heating—Gervan & Hodgins, 1095 Bank St.; electric—J. A. Ellacott, 595 Bank St.; plastering—Bowman Bros., 18 Thornton.

The following sub-trades have been let on $7,000 residence being built on Ossington Ave.: plumbing and heating—A. W. Allen, 15 Euclid St.; plastering—Davis-Daly, 85 Union St.; electric—J. N. Cherry, 50 Victoria.

The following sub-trades have been let in connection with $5,000 residence being built on Hawthorne Ave.: plumbing and heating—F. A. Brunke & Co.; Clarkstown; electric—E. Ladouceur, 126 Willow; plastering—P. Beaupre, 27 Heney St.

Sub-trades as follows have been let on $6,000 residence being built on Fentiman Ave.: plumbing and heating—A. W. Allen, 15 Euclid; electric—J. N. Cherry, 50 Victoria; plastering—Davis & Daly, 85 Union.

The following sub-trades have been let on $9,000 residence being built on Linden Terrace; plumbing and heating—Band & Cole, 275 Bank St.; electric—J. Davis, Bronson Ave.; plastering—Wm. Skillen, 18 Morris.

The following sub-trades have been let in connection with $20,000 apartment house on Besserer and Cobourg Sts.: electric—H. L. Allen, 272 Bank St.; heating and plumbing—Caldre & Deth, Rideau St.; plastering — A. Lynton, Westboro, Ont.

The following sub-trades have been let in connection with $7,000 residence being built on Gilchrist St.; plastering—Wm. Skillen, 18 Morris St.; heating and plumbing — Gervin & Hodgins, 1095 Bank St. Electrical work by day labor.

The following sub-trades have been let on $6,000 residence being built on Westmount Ave.: plumbing — G. E. Evoy, 945 Wellington; heating—Wm. H. Murphy, 289 Lyon St.; electric—E. Poirer, Hull, Que.; plastering—Hunt & Baker Westboro. Painting by day labor.

The following sub-trades have been let on $4,000 residence being built on Holland Ave.; electric—H. L. Allen 272 Bank St.; heating—Wm. H. Murphy, 289 Lyon St.; plastering—J. Hobbs, 143 Holland St.; plumbing—W. A. Baker, 21 Sydney St.

Sub-trades as follows have been let on $6,000 duplex residence being built on Byron Ave.: plumbing—Louis Gendron, 89 Bridge St.; heating—J. R. Cameron, 488 Lewis St.; electric—Jas. Milks, 26 Warren Ave. Plastering by day labor.

A. C. Anscombe has the general contract for a $6,000 residence at 118 Third Ave., being built for A. D. Murphy; 2½ stories, 28 x 37'9", brick veneer construction.

Sub-trades have been let as follows for $6,000 residence being built on Fairmont Ave.: plumbing—Band & Cole; heating—Capital Hardware Co.; electric—J. W. Ellacott; plastering—Chas. H. Patterson.

The following sub-trades have been let on $100,000 apartment building on Armstrong St:. heating—Capital Hardware Co.; plastering—E. Tressider, 56 Fifth St.; electric—J. W. Ellacott, 595 Bank St.; plumbing—Band & See, 775 Bank St.

Capital Construction Co., Ltd., have the general contract for a $7,500 residence on Rockwood Ave. for M. Normand, 559 St. Patrick St.; 2½ stories. 30 x 27, stucco construction.

The following sub-trades have been let on $8,500 residence being built on Keefer St.: plumbing and heating—Erskine & Smith, Nicholas St.; electric—Lewis Stanley, 69 Metcalfe; plastering—Daly-Davis, 85 Union St. All of Ottawa.

The following sub-trades have been let on $8,500 residence being built on Keefer St.: plumbing and heating—Erskine & Smith, Nicholas St.; electric—Lewis Stanley, 69 Metcalfe; plastering—Daly-Davis, 85 Union St. All of Ottawa.

A. Morgan, 176 Hinton St, has the contract for plumbing and heating, and J. W. Ellacot, 596 Bank St., the contract for electric work in connection with $4,200 residence on west side Smirle Ave.

The following sub-trades have been let on $6,000 residence being built on Huron St.: electric—Chas. Wallace, Bank St.; plastering—J. Hodge, 386 Gladstone St; heating and plumbing—O. A. Archambault, 67 Wellington St., Hull, Que.

Port Credit, Ont.

A. E. McKay has the general contract for $7,000 residence being built on Mississauga Road for E. B. Munroe. 2 stories, 32 x 40, brick construction.

The following sub-trades have been let on $5,000 residence being built on Forrest St.: electric—H. Moore, Cooksville, Ont.; plumbing and heating—T. Derry, New Toronto; painting—W. J. Scott, Port Credit.

Point Edward, Ont.

R. B. Bawtenheimer, 224 Cameron St., has the general contract for a $5,000 residence to be built for Drummond Greenwood, Albert St. No materials purchased.

Paris, Ont.

The contract for plastering in connection with duplex residence on Jane and Alexander Sts., has been awarded to Robt. Farlow.

Point Grey, B. C.

J. N. Sinclair, Hollyburn P.O., North Vancouver, is the architect and general contractor of a $5,000 residence at 4270 Osler Ave. for Mrs. E. D. Matheson. 2 stories, 27 x 37, frame and stucco construction.

Gormally & McGreew, 1376 Burrard St., Vancouver, are the general contractors of a $5,000 residence at 4533—2nd Ave., being built for Mrs. I. E. Green, 3648 Point Grey Road, Vancouver, B.C.

Campbell & Hodgson, Vancouver, B.C, are the architects and general contractors of a $6,000 residence on 13th Ave. West, for Mrs. C. J. Binney, Point Grey; 2 stories, 26 x 38, frame and stucco construction.

Quebec, Que.

J. A. Laberge, L'Ange Gardien, has the general contract for a $4,800 residence on Repentigny St., for Allan R. Thorn, 118 Maisonneuve St.

Sydney, N. S.

H. M. Israel, Brookland St, has the contract for plastering in connection with $12,000 residence being built on Kings Road.

Sortin, Que.

Sub-trades as follows have been let on $10,000 bunk house being erected in C.P.R. Yards, near Montreal: electric—J. Byron, 1665 Delorimier Ave.; plumbing and heating—J. Trafford, 160 Decarie Blvd.; plastering and painting—W. H. Madegan, 949 Atwater Ave.

Sarnia, Ont.

H. Pippard, 156 Campbell Ave., has the general contract for a $7,000 residence on north College Ave, for C. L. Brown, Front St. The lumber is being supplied by Laidlaw Lumber Co., 166 Devine St.

Miller & Ellis, 258 Bright St., have the general contract for an $8,000 residence on west side Brock St, for Capt. A. E. McGregor, 226 N. Vidal St. No materials purchased.

St. Catharines, Ont.

C. Widdicombe, 3 Stuart St, has the contract for electrical work, and Ward & Hagar, Allanburg, Ont., the contract for plastering, in connection with residence being built by W. E. Swartz, 19 Russell Ave.

Sault Ste. Marie, Ont.

Wm. Oven, 111 Albert St. West, has the general contract for a $6,500 residence on Alexandra St, for Wm. Goatbe, 327 Pim St. The following subtrades have been let: excavating and masonry work—McLarty Bros., 38 Wellington St. East; heating and plumbing—Hojem Bros., 206 Albert St. East; no materials purchased.

The foundations are going in for a $5,500 residence on Pim St. Geo. A. Haney, 158 Pim St., is the owner and general contractor. Messrs. McIntyre & Kelly, Adams Block, have charge of the excavating and masonry work. No materials purchased.

Stratford, Ont.

J. Keyes, 32 Young St, is the builder of a $5,000 residence for H. Partridge, 140 Water St. Electric, plastering and painting trades to be let.

Toronto, Ont.

Iacona Bros., 1422 Gerrard East, are the owners of 2 stores and apartments to be built on west side Coxwell Ave., near Gerrard East, to cost $12,000 each. Tenders being received by owners on heating, plumbing, plastering, electric and painting trades. M. O'Connor, Markham St., has the contract for excavation work.

Alex. Grant, 837 Logan Ave., has the general contract for store and apart-

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ments at 126 Danforth Ave., costing $9,000. Heating, plumbing, plastering, electric and painting trades will be let by the owner, Wm. E. Playter, 28 Playter Crescent.

The following sub-trades have been let on $6,500 residence being built on Rushton Road and Valley Road: plastering—A. M. Elliott, 55 Roach Ave.; painting—H. Crooks, 1951 Dufferin St.

Fred. C. Elgie, 128 Merton St., has the contract for masonry work and C. A. Bradshaw, 183 Davenport Road, the contract for carpentry in connection with alterations to residence for duplex at 94 Park Road.

J. C. Scott Co., Ltd., 106 River St., has the contract for carpenter work in connection with $5,000 residence being built on Forest Hill Road.

Thos. Pinkerton, care 225 Wright Ave., has the contract for masonry work in connection with $3,500 addition to residence and studio at 225 Wright Ave.

Westmount, Que.
T. S. Hudson, 271 Mountain St., has the general contract for a $16,000 residence on Kitchener Ave. No materials purchased. All work day labor by general contractor.

Windsor, Ont.
Arthur Pickering, Hall Ave., has the contract for heating and plumbing in connection with $4,000 residence being built on Marentette Ave.

Messrs. Bateman & Tesch, Albert St., have the contract for heating and plumbing of $4,000 residence being built on Elsmere Ave.

Power Plants, Electricity and Telephones

Bagotville, Que.
Tenders have been received by the town council for 5 transformers in connection with the $150,000 hydro power plant equipment at Riviere A Mars.

Carillon, Que.
The Quebec New England Hydro Corporation, Montreal, Que., are having plans drawn for the raising of a dam on Ottawa river, that will cost $30,000.

Regina, Sask.
W. M. Sharon, provincial architect, Regina, Sask., is preparing plans for an addition to telephone building costing $65,000.

Yorkton, Sask.
An addition to the light and power plant estimated to cost $63,000 is contemplated. This will include the purchase of two 300 H.P. Mirrless Bickerton and Day Diesel engines, two generators, etc.

CONTRACTS AWARDED

Edmonton, Alta.
L. F. Toby, 642 Tegler Bldg., Edmonton, has the general contract in connection with 7 regulator station houses, $1,200 each, for the Northwestern Utilities, Ltd., Edmonton.

Winnipeg, Man.
Work is to start at once on a $108,630 stand by plant, foot of James St., for the Winnipeg Hydro Electric System. Jno. Gunn & Sons, Ltd., 616 Avenue Bldg., Winnipeg, have been awarded the general contract.

Miscellaneous

Port Arthur, Ont.
Tenders will be received by the secretary, R. C. Desrochers, Dept. of Public Works, Ottawa, Ont., till September 20 for the construction of a section of rubble mound breakwater in the main harbor. Plans and specifications with Department of Public Works, Ottawa, Ont.

Fires

Melville, Sask.
Fire recently destroyed the Municipal Electric Light and Power Plant with a loss of $100,000.

Montreal, Que.
Fire recently destroyed the bakery of D. M. & G. A. Aird, 180 Lagauchetiere St. East, with a loss of $20,000. The owners will rebuild shortly.

The institution at 340 St. Hubert St., owned by Soeurs de la Providence, was partly destroyed by fire recently with a loss of $85,000. Owners will rebuild shortly.

Penetanguishene, Ont.
Fire recently destroyed the factory of the International Fibre Board Co., Ltd., with a loss of $150,000.

Quebec, Que.
Fire recently destroyed the laundry of the Frontenac Electric Laundry & Dye Works with a loss of $20,000. Work of rebuilding will start soon.

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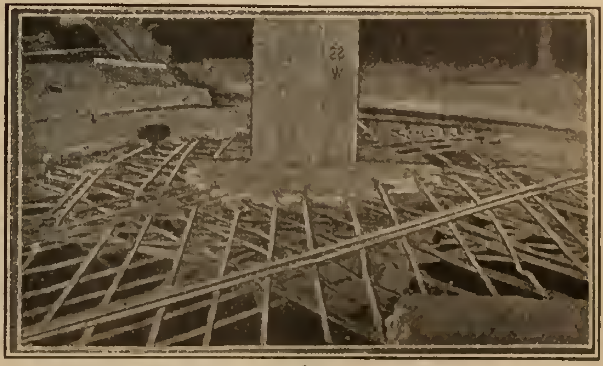
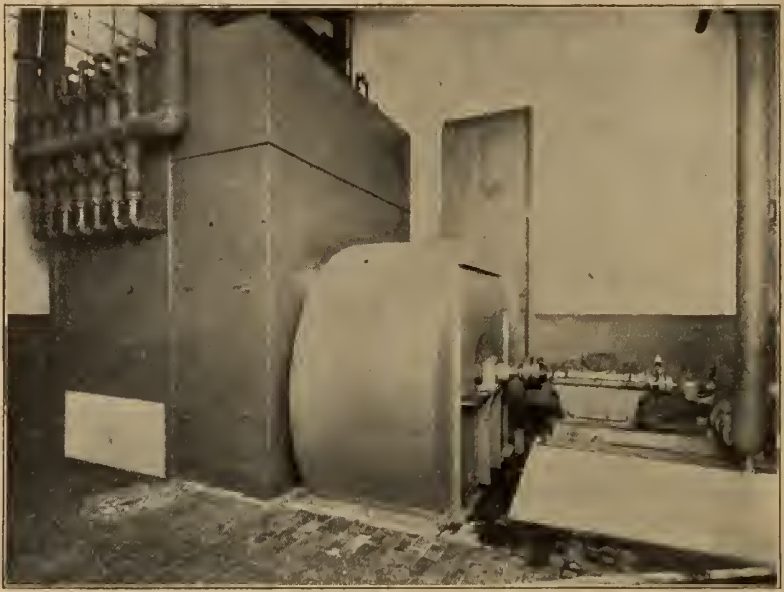


Arrangement and condition of bars around column



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Suspension Bridge Over the Delaware River

There is being built over the Delaware River, between the cities of Philadelphia and Camden, a large bridge which will have a main span of 170 ft. between centres of towers, or 154 ft. more than that of the Williamsburgh Bridge, at New York, at present the longest suspension bridge in the world. It will be a single-deck structure, with only two cables, while the three New York bridges have each four cables and two decks. A 60 ft. roadway in the middle of the deck will be flanked by a tramway track on each side, inside the cables, and two rapid-transit railway tracks outside the cables. Two 10 ft. footpaths will be carried over these latter tracks by cantilever brackets on the stiffening trusses. The use of two cables is based on the fact that the stresses are more definite, and because a better arrangement of the floor space can be obtained. Instead of relying on rigid steel or masonry towers carrying roller saddles to take up the motion of the cables over their bearings, the towers are designed to take up this motion.

Wastage in Steel Manufacture

At the annual general meeting of the American Iron and Steel Institute, a paper was presented by Mr. H. T. Morris, in which the more serious sources of wastage of material and labour in steel manufacture were reviewed generally, and suggestions put forward for their elimination or reduction. Amongst the more prominent changes in technique foreshadowed with this end in view were oxygen enrichment of air supplied to producers, electrification of rolling mill drives, standardization of plant units, processes and methods of sampling and testing, and application of modern scientific knowledge to the production of sounder ingots. More thorough utilization of by-products was advocated and recovery of metal from slags, improvements of transportation facilities inside the works, with greater co-ordination of effort generally, were also amongst points dealt with. Stress was laid upon the need for consideration of matters affecting the worker in his home and community life. Education, accident prevention, housing, and service pensions were included in this category.

Waterproof Sandpaper

This is one of those industrial facilities whose advent has been curiously delayed these many years. It has only recently been put upon the market, and it at once permits the use of the abrasive under damp or positively wet conditions. Painted, varnished, or enameled surfaces may be cleaned off without raising dust.

Both the front and the back of the paper are waterproofed in such a way that the paper does not become soft when wet; and the abrasive material does not come off. The paint or other substance which accumulates on the surface in the process of rubbing is easily washed off. The material costs more than the older kind, but it is said to last ten times as long.

The Inspector cuts out a narrow strip of the built-up roof from each 25 squares of roof area. These strips are carefully examined and replaced, being reinforced in such a way that the cut does not impair the strength of the roof. The thick top layer of Specification Pitch and the heavy wearing surface of gravel or slag are then applied.

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That means the Barrett Inspector will see personally that the high-grade pitch and felt called for by The Barrett Specification are properly applied to give maximum strength and durability.

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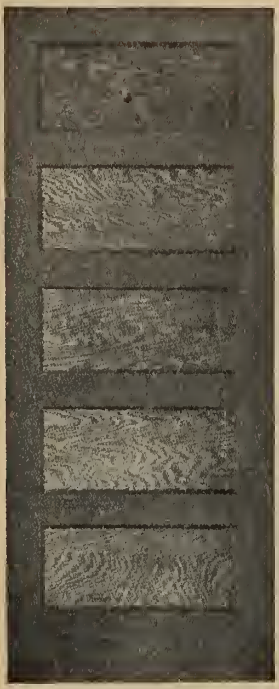

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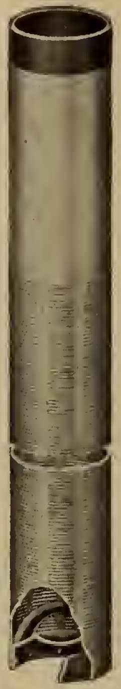

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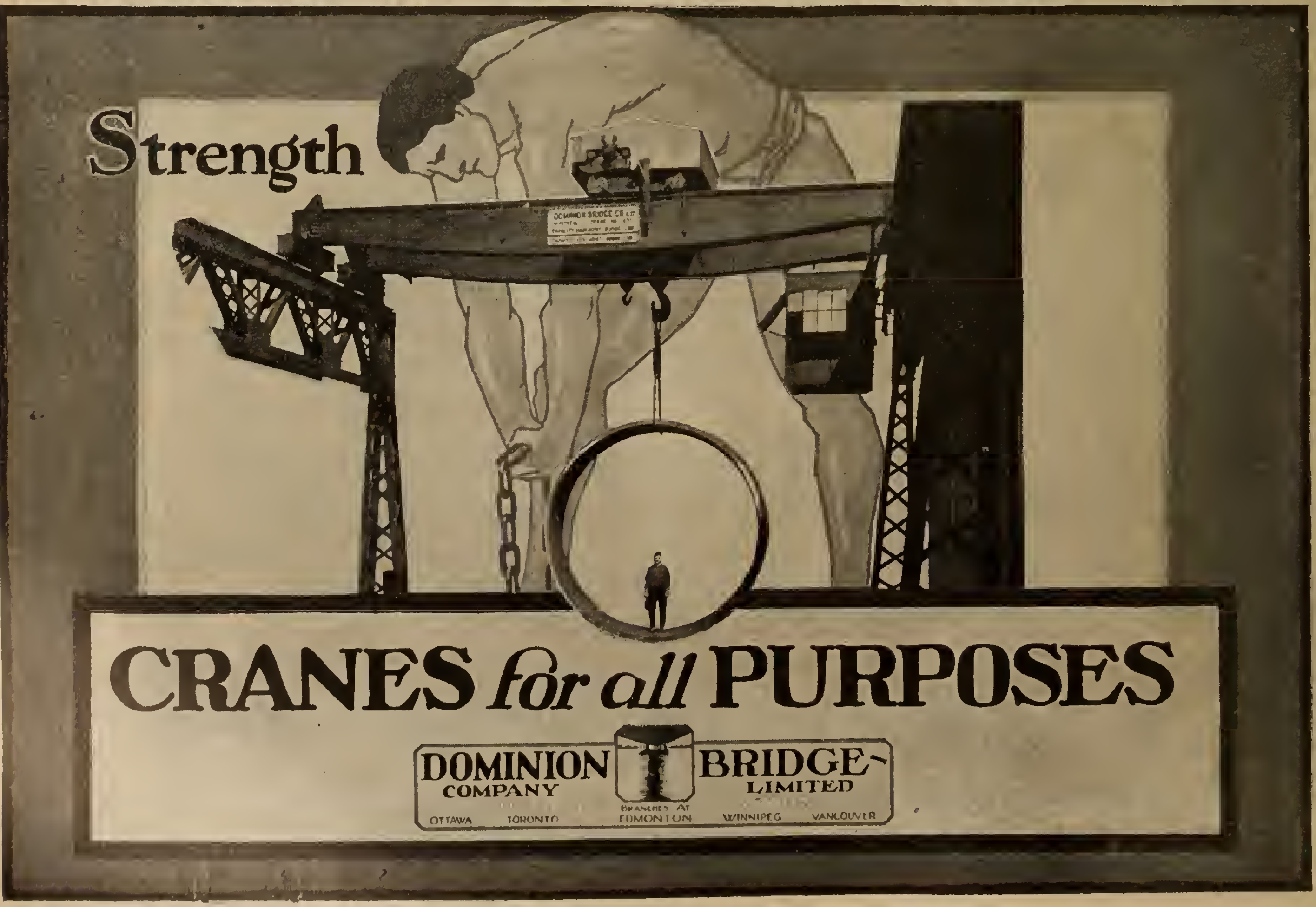

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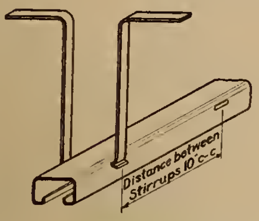

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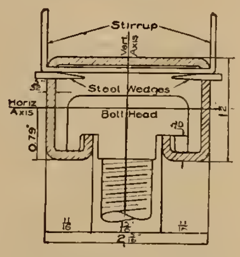

Cross-section of Box Rail showing bolt used for attaching equipment.

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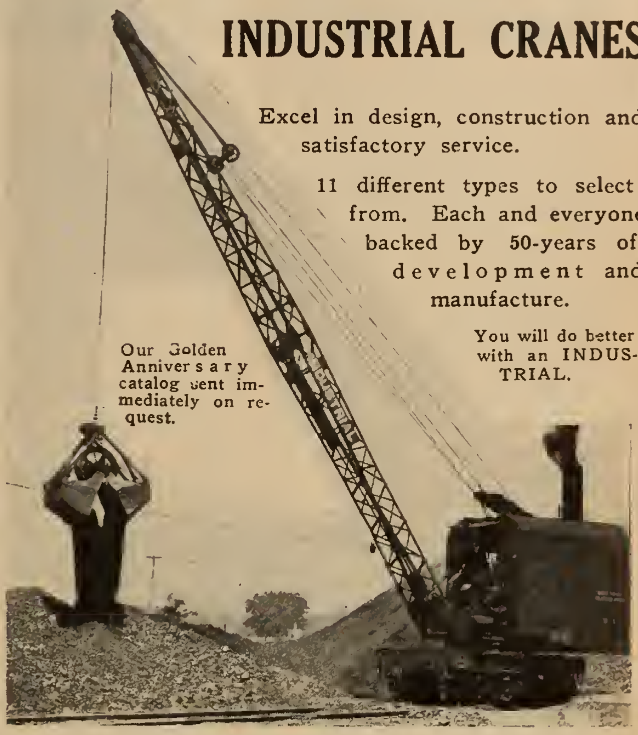

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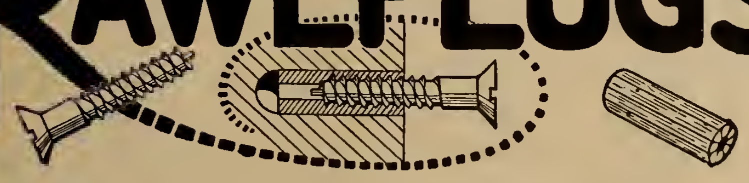

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	

LIME (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	[illegible].00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.25	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 base	6.00 "	7.00 base	
Cast iron pipe	per ton	67.50 "	60.00 "		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.50	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60–.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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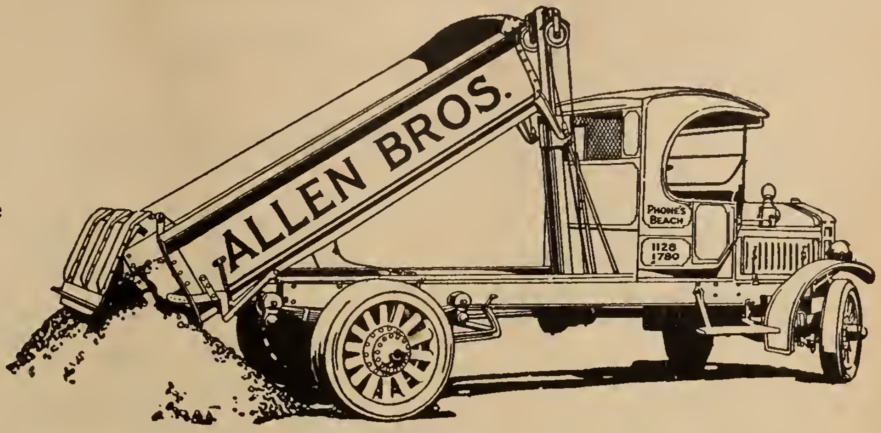

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Consulting Engineers, Surveyors and Architects

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Water Supply; Sewerage and Drainage; Wate
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Reports, Designs, Supervision of Construction.

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When You Want It"

The above is the slogan we always live up to.
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Hardwood Flooring

can be met promptly
In Maple, Birch and Plain or Quarter Cut Oak

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Manufacturers of
Copper, Brass, Bronze Wire
Copper Clad Steel Wire.
Insulated Wire of all kinds
Lead Covered and Armored Cables
Cable Terminals, Junction Boxes, etc.

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Montreal, Toronto, Hamilton,
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ENAMELED BRICK TALKS FOR ARCHITECTS

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The greatly increased efficiency of the Modern Power House is the result of most careful thought and study on the part of the Country's leading Engineers.

Elimination of unsatisfactory materials for interior lining has led to the universal adoption of Enameled Brick—BECAUSE for thirty years it has stood the most severe tests.

ENAMELED BRICK—Give the greatest amount of permanent Light reflection.

ENAMELED BRICK—Are impervious to Oils and Grease and can be cleaned with Soap and Water.

ENAMELED BRICK—Cannot be dislodged from place by vibration, thus eliminating all Maintenance charges.

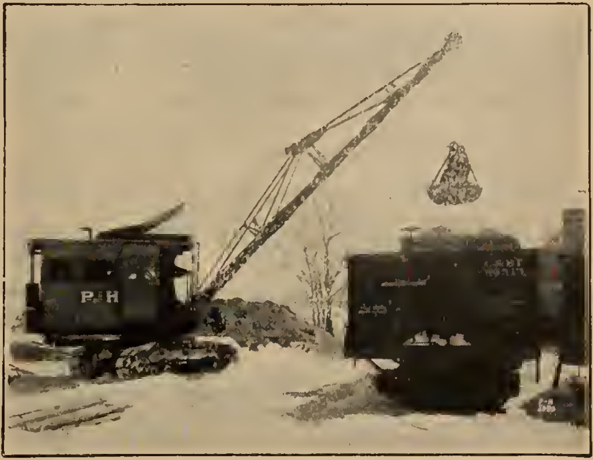
ENAMELED BRICK—Can be used as a part of the bearing walls, cheapening the Cost of Construction.

ENAMELED BRICK—Can be supplied by us in White or Solid Colors and in Mottled effects.

Specify "American" Enameled Brick and secure THE BEST.

AMERICAN ENAMELED BRICK & TILE CO.

Manufacturers of Enameled and Fire Brick,
Dealers in Face Brick of all Colors and Textures.
52 Vanderbilt Avenue, NEW YORK



NOT AFRAID OF COLD WEATHER

P & H Material Handling Cranes, Excavators and Gasoline Shovels are not bothered by low temperatures—there are no water and fuel troubles—no fires to keep up all night, no watchman. One operator only is required. The P & H is as easy to start as a motor truck—and when the day's work is over—as easily shut down.

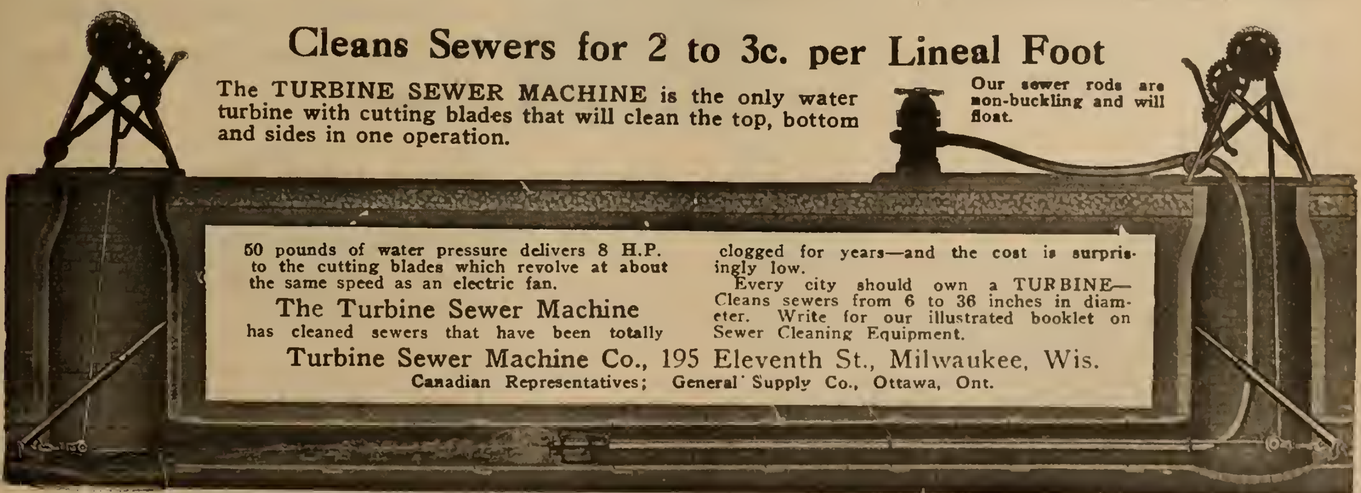
The powerful crowding motion of P & H Shovels is responsible for their satisfactory excavating of frozen ground—on one job last winter, the P & H had to strip the frozen surface to allow other shovels (which had failed) to proceed.

Bulletin 58-X gives all details.

PAWLING & HARNISCHFEGER CO.
3843 National Avenue, Milwaukee, Wis., U. S. A.

PAWLING & HARNISCHFEGER CO. P&H

CORDORY CRANES



Cleans Sewers for 2 to 3c. per Lineal Foot

The TURBINE SEWER MACHINE is the only water turbine with cutting blades that will clean the top, bottom and sides in one operation.

Our sewer rods are non-buckling and will float.

60 pounds of water pressure delivers 8 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

The Turbine Sewer Machine has cleaned sewers that have been totally clogged for years—and the cost is surprisingly low.

Every city should own a TURBINE—Cleans sewers from 6 to 36 inches in diameter. Write for our illustrated booklet on Sewer Cleaning Equipment.

Turbine Sewer Machine Co., 195 Eleventh St., Milwaukee, Wis.
Canadian Representatives; General Supply Co., Ottawa, Ont.

Structural Steel AND Bridges

192′ 0″ Clear Span Highway Bridge over Thames River, North Richmond St., London, Ont. Erected 1922

We build and erect all kinds of Structural Steel Bridges, Roof Trusses, Bank and Office Railings, Stair Work, Elevator Grilles, Fire Escapes, etc.

Over 5,000 Tons in Stock of

Beams, Column Sections, Angles, Tees, Plates, Bars, Checkered Floor Plates, etc.
Annual Capacity 18,000 Tons

McGregor & McIntyre, Limited
1139 Shaw St. TORONTO, CAN.

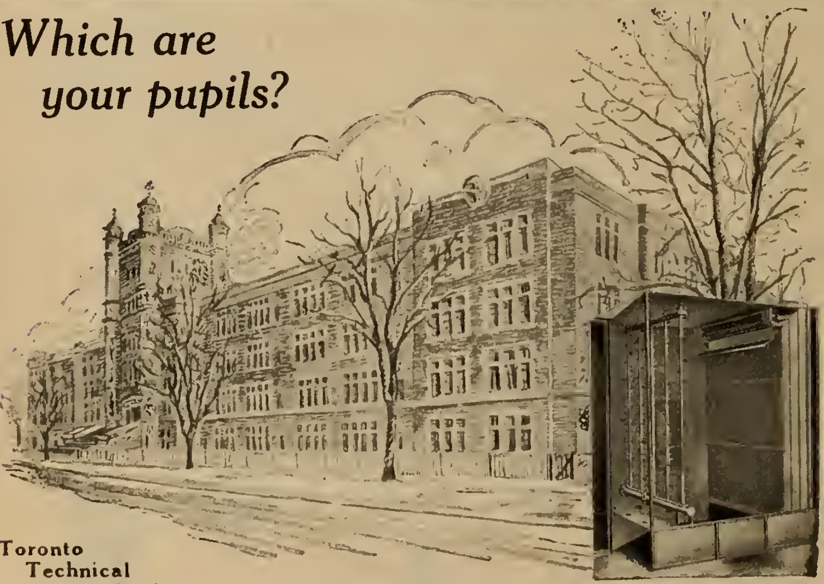
STANDARD STEEL

CONSTRUCTION COMPANY LIMITED

WELLAND, ONT.

Engineers
Fabricators
& Erectors
of Steel
Buildings
& Bridges
STEEL PLATE
BARS & SHAPES

Which are your pupils?



Toronto Technical School

Alert and Healthy or Sleepy and Stupid

Toronto Technical School solved this problem in advance by—tried and proven method—the installation of a

Carrier - Automatically Controlled-Heating, Ventilating, and Humidifying System.

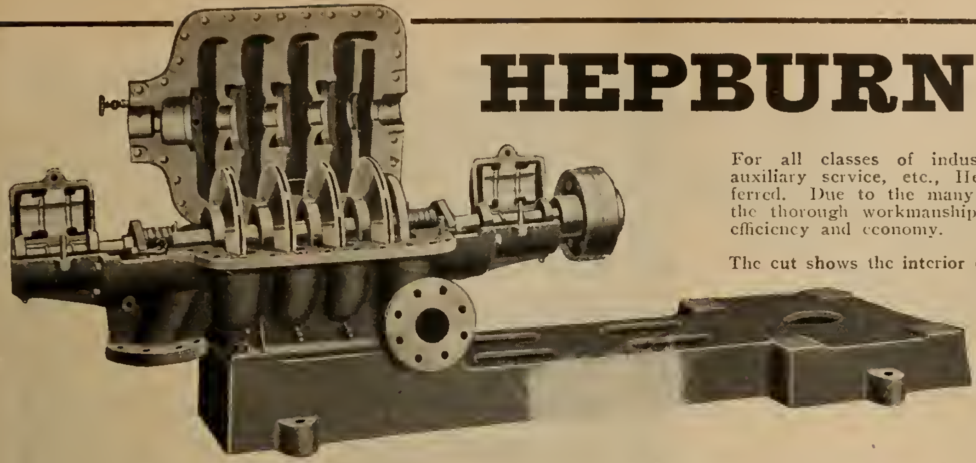
Many cities have used these systems in their schools with marked success—and their schools reflect the fame of graduates.

Better health results also as 90% of the germs are washed out and the temperature and humidity in each and every room is the same and under the competent control of one person.

Dependable operation records—with not a class dismissed for lack of heat in thirty years—are available for your inspection.

We will be pleased to supply literature or answer questions from responsible parties, who write Dept. 12.

Canadian Blower & Forge Company, Ltd., Kitchener, Ontario



HEPBURN PUMPS

For all classes of industrial service, water works systems, fire auxiliary service, etc., Hepburn centrifugal pumps are to be preferred. Due to the many exclusive features in their design and to the thorough workmanship put into them, they are noted for both efficiency and economy.

The cut shows the interior of a 4-Stage Split Casing Centrifugal Pump.

John T. Hepburn
Engineers and Iron Founders
18-60 Van Horne St., Toronto

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Main Office and Works: - - - Walkerville, Ontario

Designers, Manufacturers and Erectors of
STRUCTURAL STEEL WORK

- Railway and Highway Bridges
- Locomotive Turntables and Train Sheds
- Office Buildings and Manufacturing Plants
- Crane Girders and Runways, Coal and Ore Handling Bridges
- Grain Elevators, Storage Bins and Conveyor Bridges
- Tank and Plate work, of all kinds
- Blast Furnaces, Ore Bins, Coal Bins
- Lock Gates, Regulating Gates, and Penstocks
- Plain Structural Material furnished from stock

An adequate engineering staff is prepared to advise and to co-operate with prospective clients by furnishing specifications, designs, estimates reports and tenders.

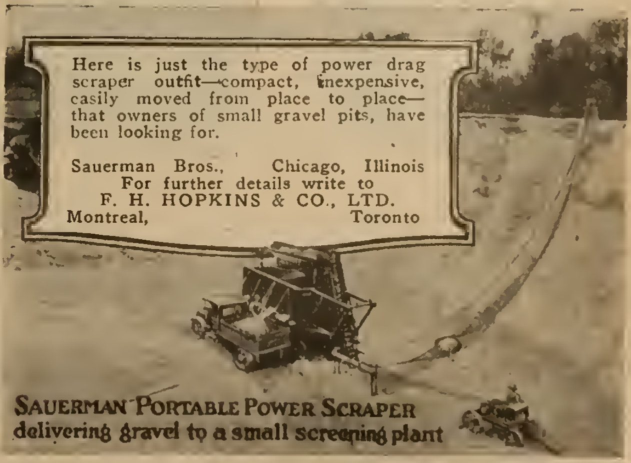
Special Attention Given to the Design and Manufacture of
ELECTRICAL TRANSMISSION TOWERS

Sales Offices:
New Birks Building, MONTREAL, P.Q.
Huron & Erie Building, WINNIPEG, MAN.
Tegler Building, EDMONTON, ALBERTA

DAKE MACHINERY
Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.
Canadian Office 45 Adelaide St., E. Toronto, Ont.
Capt. Wm. Stitt, Can. Sales Mgr.



Here is just the type of power drag scraper outfit—compact, inexpensive, easily moved from place to place—that owners of small gravel pits, have been looking for.

Sauerman Bros., Chicago, Illinois
For further details write to
F. H. HOPKINS & CO., LTD.
Montreal, Toronto

SAUERMAN PORTABLE POWER SCRAPER
delivering gravel to a small screening plant

Works at Walkerville, Ontario

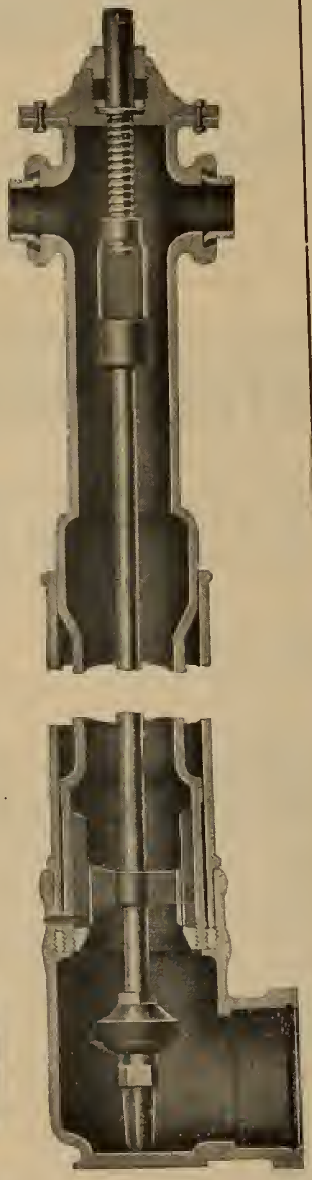
When placing your order for

HYDRANTS, VALVES and VALVE BOXES

place it with us.

MADE IN CANADA

Strong, Substantial and Modern Designs.
Prices right.
Write for prices and see.



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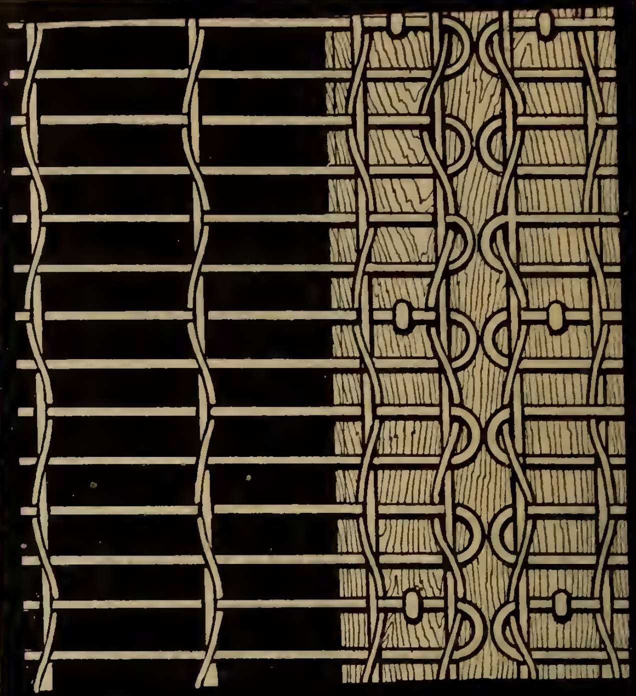
VALVE AND HYDRANT MANUFACTURERS
WALKERVILLE, ONT.



GREENING TRUSSED WIRE LATH

Definite Points of Superiority

Selvedge edge prevents cutting or scratching while handling; lathers can work faster.

"Truss" construction prevents buckling when lathe is unrolled. Lays flat. Requires no lacing at edges over studs and joists. Can be placed over sheathing without furring. The truss construction raises every other wire off the joist thus providing a perfect key to the plaster even at the joists.

Thoroughly embedded in the plaster and thus absolutely protected from corrosive effects of the atmosphere. Rust does not attack the rounded wire as it does the thin edge of sheet metal fabric.

Readily bent and formed into shape with minimum cutting. Stock width 32" and 36", rolls 105′ long.

The B. Greening Wire Co., Limited
Hamilton, Ontario
Winnipeg, Man. Montreal, Que.

CAST IRON PIPE

STANDARD CAST IRON PIPE
also
DeLAVAUD Centrifugal Process

All sizes in Stock
for

WATER CULVERT
GAS SEWER

Lake or Rail Shipment

NATIONAL IRON CORPORATION LIMITED
Head Office, Works and Docks TORONTO

XCELADUCT
Labelled under supervision of Underwriters Laboratories
GALVANIZED

Made in Canada
Conduit

Electric Wiring
Made Safe

For All
Electrical
Installations

Manufactured by
National Conduit Co., Limited
Toronto

Rails New
12, 16, 20, 25, 30, 35, 40, 60, 80, 85, 100 lb.
Splice Bar, Bolts, Spike Switches.

Rails Relaying
30, 45, 50, 52, 56, 60, 65, 70 lb.
Splice Bars, Spike, Switches.

Jno. J. Gartshore, Limited
TORONTO

One dollar per day saved on each bricklayer by using

RENFREW LIME

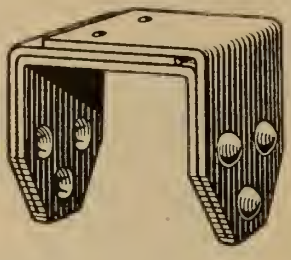
Because the mortar requires less tempering on the board. It will not set too quickly, and allows bricklayer to bed more bricks at a time. Bricks are easier bedded down. All these advantages helps the bricklayer to lay many more bricks each day. The mortar sets very hard. The lime will take more sand, and costs no more than other limes.

Jamieson Lime Company
Manufacturers: LIME, BRICK, FARM TILE.
Renfrew, Ontario

BULL DOG FLOOR CLIP

Put the BULL-DOG on *your* Pay-roll

With this device it is possible to secure the advantages of wood floors in reinforced concrete buildings—at an economical cost, at a vital saving of time, and with a reduction of 18,000 lbs. dead load per 1,000 sq. ft. Conceded by the leading architects and builders to be the best device of its kind and 100 per cent efficient. More than ten million sold last year on the American market.



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THE WESTERN STEEL PRODUCTS LIMITED
Winnipeg, Manitoba

Branches: Regina, Saskatoon, Calgary, Edmonton.
Eastern Representatives:
Heriot K. Ferguson, 908 Birks Bldg., Montreal
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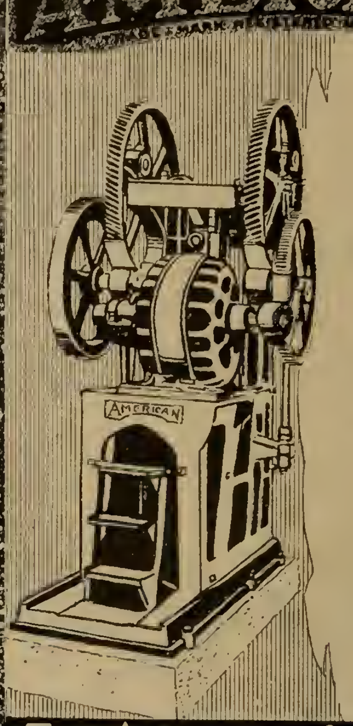
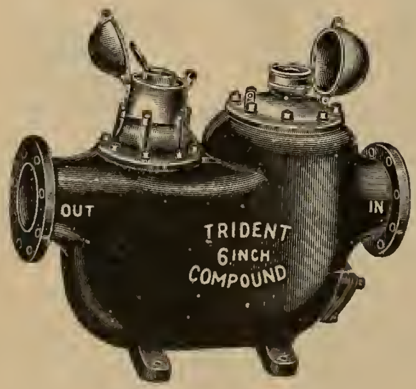
John Lindsay, 250 Richmond St. West, Toronto

AMERICAN



If you are a city engineer in a small village or a large city, and the question is again up to you to decide on pumps for your water supply, or a complete redesign of your old pumping stations—you can either worry and fret over the best and most economical solution of the problem or you can call on an American Well Works engineer, who will gladly give you the benefit of over fifty years of every day experience on municipal pumping problems.

THE AMERICAN WELL WORKS
General Office and Works
AURORA, ILL.
Chicago Office
FIRST NATIONAL BANK BLDG



Trident Compound

Until the Trident Compound appeared on the market no meter had ever been devised that would **accurately** measure "all the water all the time."

Nor has there been any other since.

The Trident Compound is in a class by itself.

It is really two meters in one—a Disc chamber for measuring low flows and a Crest chamber that takes care of everything from the latter up to the full capacity of the meter.

Let us furnish you with full particulars regarding this meter.

Neptune Meter Company, Limited
Factory and Head Offcie:
1197 KING STREET W. TORONTO, ONTARIO
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Robert W. Hunt & Co.
Limited
Consulting and Inspecting Engineers
Chemists and Metallurgists.

Expert inspection and tests on all materials and equipment.

Parties having Relaying Rails, Cars, Locomotives and other used equipment for sale, are invited to list same with us, in view of various enquiries from clients for such information.

Head Office and Laboratories: McGill Bldg., Montreal.
Branches throughout Canada, United States and Europe.

Lumber at First Cost
Prompt Delivery

Any Quantity Rough Dimension, Timber—Square and Round, Rock Elm and White Oak Timber, White Pine, Hemlock and Spruce Lumber. All thicknesses. Can be dressed in transit.
Hardwood Lumber—all kinds, all thicknesses, all grades. In our Toronto yard.
Hardwood Flooring, grade Factory and Better.
Let us quote you prices.

HALL BROS. LIMITED
26 Queen St. East, Toronto Phone: Main 2806

We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
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Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.
Engineers and Contractors
Head Office: Lumsden Bldg., Toronto

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ENGINEERS & CONTRACTORS

ROAD WORK
EXCAVATION
CONCRETE
CONSTRUCTION

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Specializing in
Asphalt Paving
For Cities and Towns

Toronto Plant:
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LIMITED
ENGINEERS AND CONTRACTORS

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James A. Thomson, Vice-President

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.
LIMITED

MANUFACTURERS OF
Flexible and Flange Pipe
and Special Castings

Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
for Water, Gas, and Culvert
HAMILTON, ONT.

VANCOUVER WOOD PIPE
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Contractors for Waterworks Construction,
Manufacturers of Wire-Wound Wood Pipe, Continuous Stave
Pipe, Tanks, Silos, Steam Casing.
See our new patented Wood Pipe Coupling—Positively LEAK PROOF
We are the originators of the BORED OUT Wood Sleeve Coupling
Write for Illustrated Catalogue.
508 Hastings St. W. VANCOUVER, B.C

Highway Bridges

CANADIAN TANKS DES MOINES TRADE MARK

We design, fabricate and erect various types of structural steel highway bridges. Quick shipments and experienced erection crews are some added features of DES MOINES service.

Canadian Des Moines Steel Co., Ltd.

267 Inches Ave., Chatham, Ont. *64 St. James Street, Montreal, Que.*

CANADIAN DES MOINES

"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

INTERNATIONAL
ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
Company, Limited
300 Campbell Avenue, Toronto

CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the
Greatest Resistance
to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

HEAD OFFICE:
Mark Fisher Bldg., Montreal

Works at: Fort William, Ont., St. Thomas, Ont
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When Breakdowns Occur

Every contractor has experienced breakdowns in his equipment—engines boilers, mixers, steam shovels, etc.—and has needed welding done promptly. When those breakdowns occur, call on us. We are completely equipped to make all kinds of repairs by the Electric Arc Welding process. We offer—

A Fast Welding Service

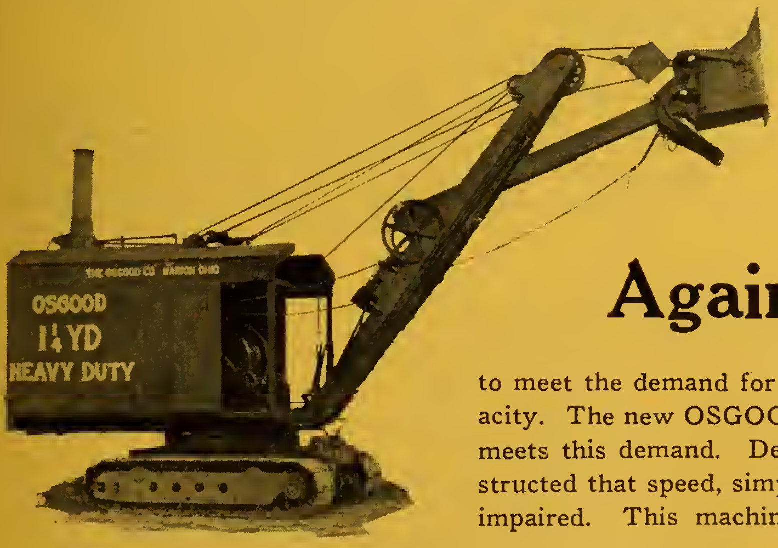
Illustrations show Cast iron engine frame which was broken in three pieces. Welded by our process without pre-heating, so that it was perfectly true when finished.

Call on us when you need work done. You'll get satisfaction on every job.

Lincoln Electric Company of Canada, Limited

136 John St., Toronto

Montreal Office: 112 Coristine Building



OSGOOD

Again Steps Forward

to meet the demand for a Revolving Steam Shovel of greater capacity. The new OSGOOD 1¼-yd. Heavy Duty now on the market meets this demand. Designed for Heavy Duty work, yet so constructed that speed, simplicity and ease of operation are in no way impaired. This machine must be seen to be fully appreciated.

Ask for Bulletin 236

¾ - 1 - 1¼ yd. Revolving Steam Shovels,
Clamshells and Draglines
1½ - to 6 yd. Railroad Type Steam Shovels

The OSGOOD Company, Marion, Ohio, U.S.A.

"Dominion" Wire Rope

Flexibility and Strength

for the

Stiffest Requirements

Let us quote you for
BLOCKS, CLIPS, THIMBLES AND SHACKLES

THE DOMINION WIRE ROPE CO., LIMITED

Head Office MONTREAL Also at: TORONTO - WINNIPEG

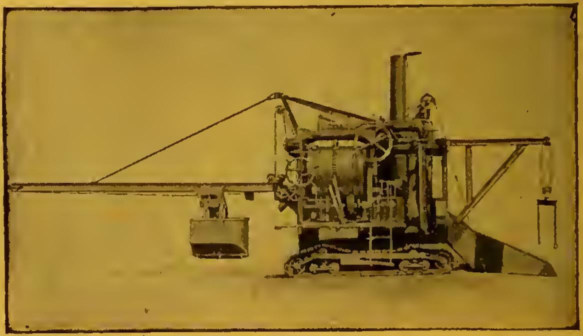
THE BIG THREE!

"Marion" Steam Shovels and Ditchers

"Industrial Works" Cranes

"Ransome" Concrete Mixers

Fast
Mixing
and
Discharge



Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F. H. Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, September 19, 1923 No. 38

Contract Record and Engineering Review

Cooksville to Port Credit

Now comes the road connecting the village of Cooksville, on the new provincial highway from Toronto to Hamilton, with Port Credit on the Toronto-Hamilton Highway. This road, previously surface-treated macadam, has been improved with a Hot-Mix Asphalt surface.

The Cooksville to Port Credit road is yet another instance of how a good old macadam road may be used as a foundation for a modern Asphalt highway, thereby securing all the splendid advantages of Asphalt with considerable economy in construction. Our illustration was taken looking north to Cooksville. The work was done by the Brennan Paving Company who used Imperial Asphalt exclusively.

IMPERIAL Asphalt PRODUCTS

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft in diameter.

TANKS

and SILOS to Order

Any Size—Any Style

CONTINUOUS STAVE

Wood Pipe

or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded

STEEL

DOUBLE COUPLING

with Inside Ring

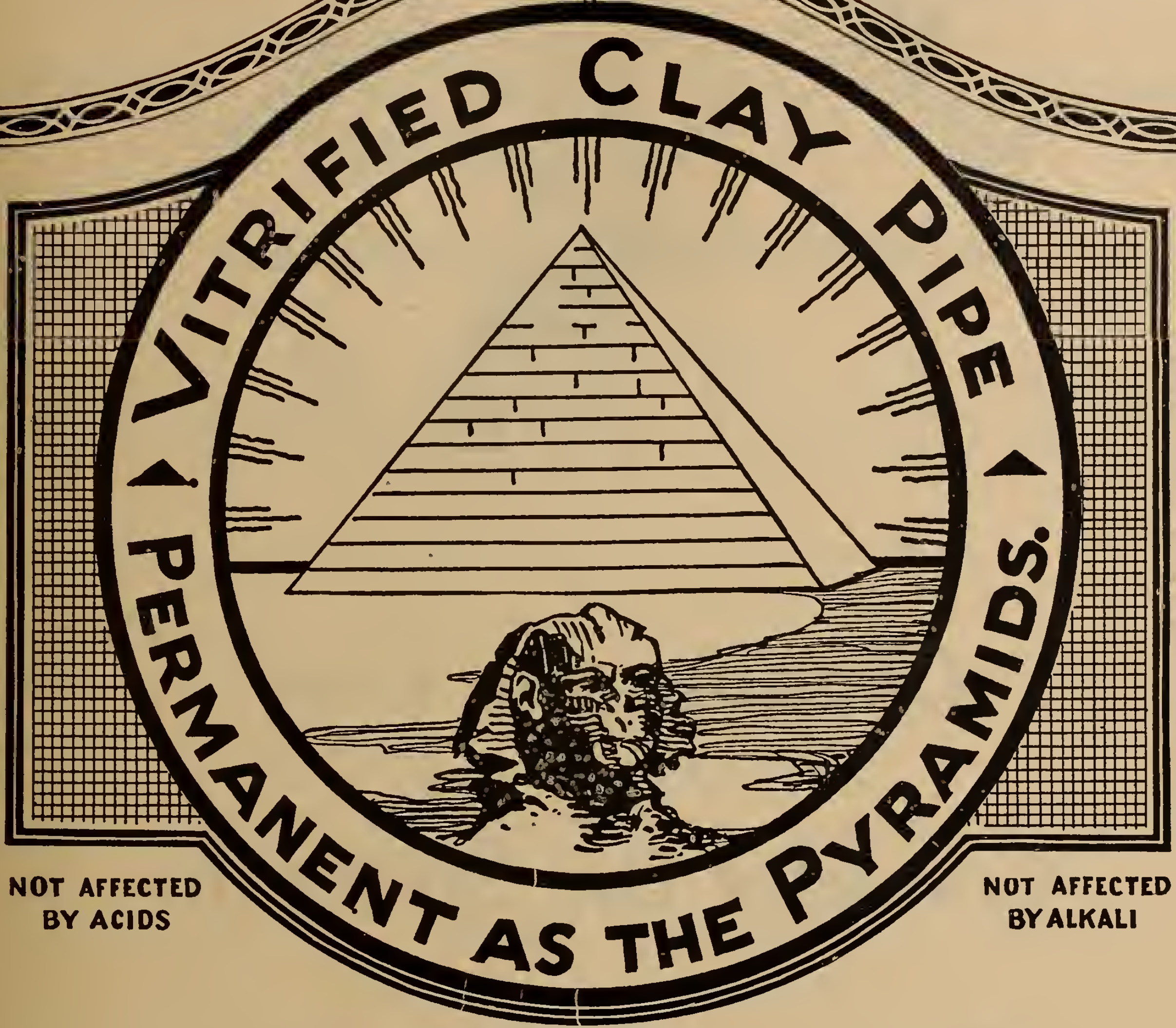
Galvanized

has entirely eliminated joint leaks and has perfected

WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.



When the largest cities in the world use Vitrified Salt-Glazed Pipe because they have proved that in the end it is the most economical, can your municipality afford to use substitute materials because in the first place they may be a little cheaper?

Vitrified Clay Pipe Publicity Bureau

Toronto, Ont. St. Johns, P. Q. New Glasgow, N. S.

Rocktile Miltonia

"The Brick Everlasting"

Consider the Cost—

Consider the Strength—

Consider the Beauty—

then

write to

TORONTO BRICK COMPANY, LTD.

HEAD OFFICE
60 VICTORIA STREET
Phone Main 3067

PLANTS: YORK SWANSEA MILTON COBOCONK

Samples Sent on Request.

$80.00

For a Burrell Rock Drill

We have some Burrell Rock Drills still on hand which we are desirous of getting out of the way, hence the very low price.

New?
Certainly They Are

These drills are guaranteed brand new and are part of the Burrell standard stock.

Repair Parts

We have a very large quantity of repair parts and we also have all the jigs and tools to make any parts required at any time.

Sizes

The sizes range from 2½" x 4" to 3-⅝" x 7". The same price covers all sizes. Price does not include tripod. These drills will likely fit your tripod as the shells have the standard mounting. We can supply tripods for from $75.00 to $95.00.

It will pay you to buy one or more of these drills if you have a Burrell Drill, even if you only use it for repair parts.

NAPANEE IRON WORKS
LIMITED
NAPANEE, ONTARIO

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  - Sturtevant, B. F. & Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
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- Brick Machinery & Supplies
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  - Don Valley Brick Co.
  - **Harbour Brick Co.**
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  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - Standard Steel Construction Co.
- Bridges (Steel)
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  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
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  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
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  - Mussens Limited
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  - Orton & Steinbrenner Co.
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  - Industrial Works
- Buckets, (Grab)
  - Industrial Works
- Building Materials
  - Brantford Sand & Gravel Co.
  - Britnell, Limited
  - Canadian Link-Belt Co.
  - Muldoon Ltd., J.
  - Oakley & Sons, Geo.
  - Rogers Supply Co.
  - Vitrified Clay Pipe Publicity Bureau
- Building (Steel)
  - Standard Steel Construction Co.
- Building Specialties
  - Drummond & Reeves Ltd.
- Cable
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Mussens Limited
  - Standard Underground Cable Co., of Canada Ltd.
- Cars—Steel Body
  - F. H. Hopkins & Co., Ltd.
  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - Canadian Equipment Co.
- Cars Wheels
  - Canada Iron Foundries
- Carrier Systems
  - Canadian Link-Belt Co.
  - Jeffrey Manufacturing Co.
- Castings—Grey Iron
  - Canada Iron Foundries
  - Engineering & Machine Works of Canada Ltd.
  - Hepburn, Ltd., John T.
  - Inglis Co., John
  - H. Mueller Mfg. Co., Limited
- Caulking Tools
  - H. Mueller Mfg. Co., Limited
- Cement
  - Britnell, Limited
  - Muldoon, Ltd., J.
- Cement Gun
  - Cement Gun Co.
  - F. H. Hopkins & Co., Ltd.
- Cement Hardener
  - Canada Cement Co.
  - Rogers Supply Co.
  - Spielman Agencies Regd.
- Cement Waterproofing
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
- Centrifugal Pumps
  - Canadian Austin Machinery
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - F. H. Hopkins & Co., Ltd.
  - Inglis Co., John
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  - London Concrete Machry. Co.
- Concrete Carts
  - Canadian Welding Works
  - F. H. Hopkins & Co., Ltd.
  - London Concrete Machry. Co.
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  - F. H. Hopkins & Co., Ltd.
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  - Canadian Johns-Manville Co.
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  - National Conduit Company
  - Vitrified Clay Pipe Publicity Bureau
- Conduits (Wooden Pressure Creosoted
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- Contractors' Plant & Supplies
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  - Baker Mfg. Co.
  - Bateman-Wilkinson
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Ingersoll Rand Co.
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
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  - Dake Engine Co.
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  - Mussens Limited
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  - Osgood Company
  - Thew Shovel Co.
  - Turnbull & Co., Harvard
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  - Mussens Limited
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  - Canadian Ingersoll-Rand Co.
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  - Industrial Works
- Cranes, Travelling and Locomotive
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  - Mussens Limited
  - Orton & Steinbrenner Co.
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  - Britnell, Limited
  - Dom. Tar & Chemical Co., Ltd.
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  - Canada Crushed Stone
  - Crushed Stone, Limited
  - Hagersville Crushed Stone Co.
  - Hagersville Quarries Ltd.
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  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
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  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co.
  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
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  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

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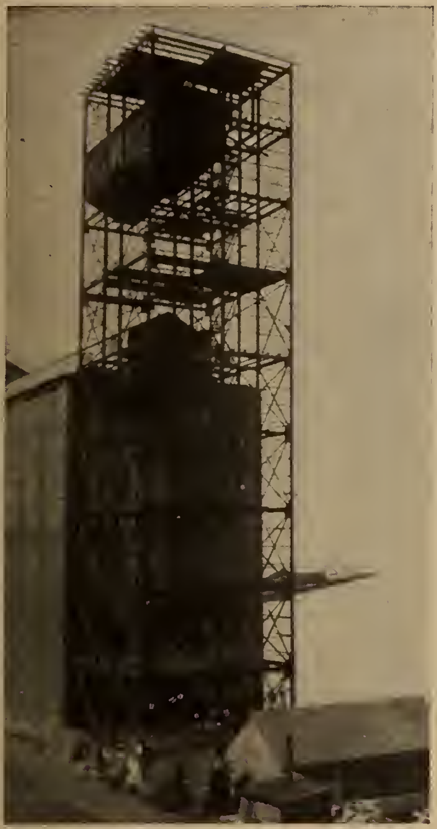

The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada
Branch Office, 410 General Assurance Bldg. Toronto, Canada

STRUCTURAL STEEL
Engineers, Manufacturers and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.

CEMENT

STONE - SAND - GRAVEL

Prompt Delivery

Rogers Supply Company Limited

Toronto, Canada

Adel. 4318 **Adel. 6900**

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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Electric Water Systems
H. Mueller Mfg. Co., Limited

Electrical Specialties
Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

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Canadian Link-Belt Co.
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

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American Enameled Brick & Tile Company

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Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

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Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

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Ball Engine Co.
Buckeye Traction Ditcher Co.
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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

Fans, Multivane
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

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National Fireproofing Co.

Fireproof Doors and Windows
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McGregor & McIntyre

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H Mueller Mfg. Co., Limited
York Manufacturing Co.

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McGregor & McIntyre

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Floor Stands
Jenkins Bros. Ltd.

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Imperial Oil Company, Ltd.
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Symmes & Co., H. H.
Vitrified Clay Pipe Publicity Bureau

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H. Mueller Mfg. Co., Limited

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Hamilton Gear & Machine Co.

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Allen Bros.
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Paris Sand & Gravel Co.
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Lumsden Engineering & Transport Co.

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Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

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Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co., Ltd.

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Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
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York Manufacturing Co.

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Canadian Equipment Co.
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Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

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Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
MacKinnon Steel Company

Lead Pencils
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Lime
Jamieson Lime Co.
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Lockers (Clothes)
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Orton & Steinbrenner Co.

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Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
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Fate-Root-Heath Co.
F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

Oil Tanks
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Inglis Co., John
MacKinnon Steel Company

Orange Peel Buckets
F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

Ornamental Iron
Canada Wire & Irons Goods Co.
Dennis Wire & Iron Works Co.
Meldrum Iron Works Ltd.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
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Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

Pencils (Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works
Greening Wire Co., B.

Pile Driving Machinery
Canadian Ingersoll-Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

Pneumatic Machinery
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Canadian Ingersoll Rand Co.
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Cook, A. D.
Fuller & Johnson Mfg. Co.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co, Limited
Hopkins & Co., Ltd., F. H.
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Mussens Limited
Waterous Engine Works Co.

Pump Valves
Jenkins Bros. Ltd.
Canadian Ingersoll-Rand Co.

Quarry Machinery
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McGovern, T. J.
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Canadian Johns-Manville Co.

Rails
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Hopkins & Co., Ltd., F. H.
Mussens Limited

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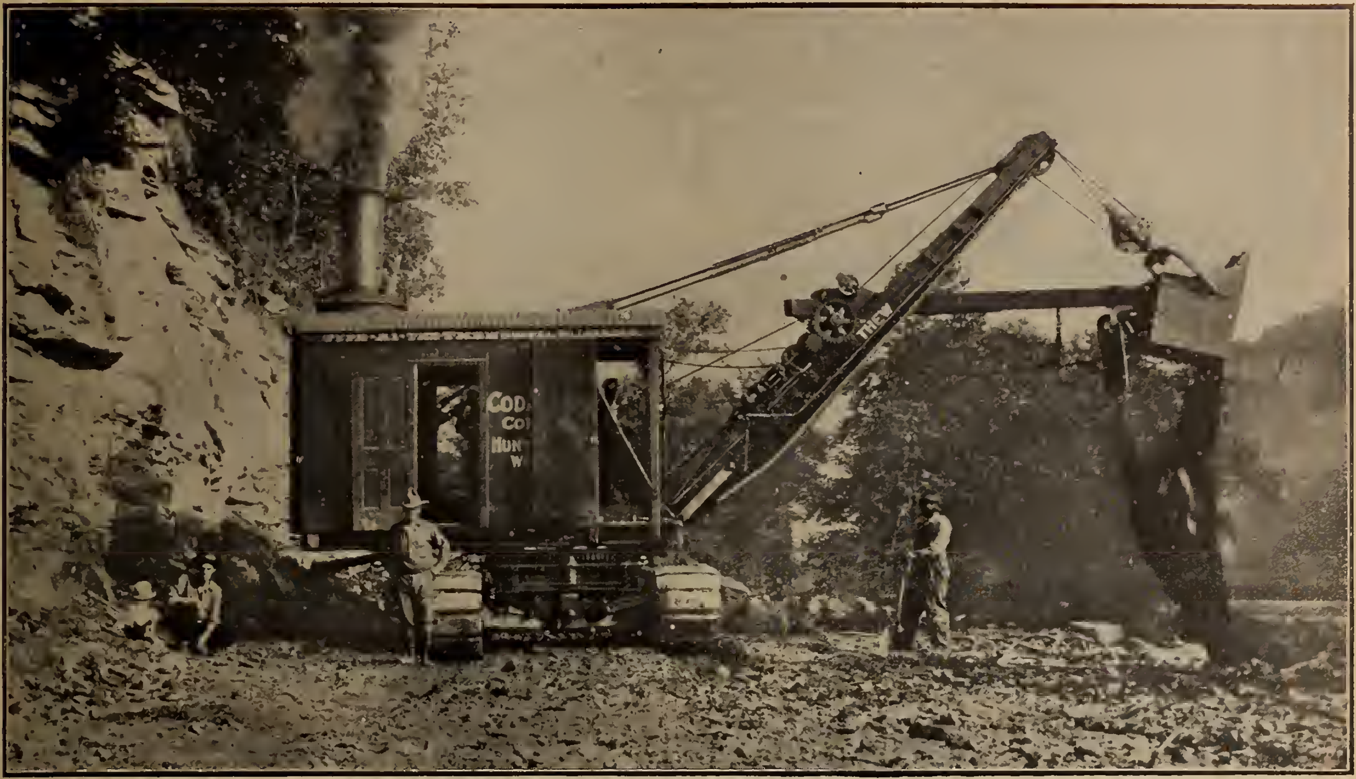

The Thew One Yard Shovel Scores Again

Down in the mountains of West Virginia it takes real shovels to produce results. That's why the Thews there are popular.

This is what C. A. Nash of the Coda-Nash Company of Huntington, thinks:

> "We are more than pleased with our Type A-1. We have had the shovel on this particular job 22 days. With the combined task of digging and holding to grade our shovel has completed a road 4600 feet in length and 26 feet wide. All digging has been in 100% rock.
>
> From my experience with other makes and sizes of shovels I have yet to see a better machine than the 1 yard Thew. This machine is doing work that would test the mettle of any 2½ yard machine."

Mr. Nash knows shovels and shovel construction. Naturally he prefers the balanced Thew with its plate girder boom, powerful crowd, simple engines and real power steering caterpillar truck.

There is another of those instructive folders coming out this month. If you don't get your copy mention 623 when you write.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

THE WILSON EQUIPMENT COMPANY,
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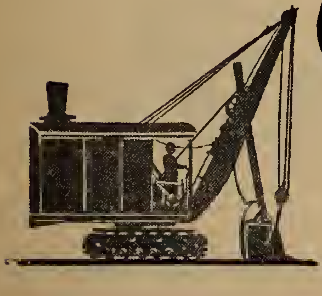
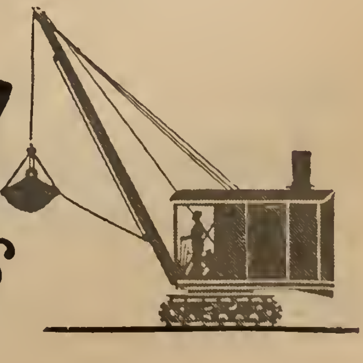
GORMAN'S, LIMITED,
Calgary, Edmonton, Canada.

T. M. GRINDLEY COMPANY,
1158 Homer St., Vancouver, B. C.
THE EASTERN EQUIPMENT COMPANY
Dorval, Quebec, Canada.



Thew
Power Shovels



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  - Watson Jack & Co.

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  - Dom. Tar & Chemical Co., Ltd.

- Road Oil
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  - Imperial Oil Company, Ltd.

- Road Tar
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.

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  - A. W. Carmichael Ltd.

- Roofing Cement
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  - Dom. Tar & Chemical Co., Ltd.

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- Steel Curb and Gutter Forms
  - Heltzel Steel Form & Iron Co.

- Steel Curb Forms
  - Heltzel Steel Form & Iron Co.

- Steel Pipe
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  - Horton Steel Works, Ltd.
  - Inglis Co., John
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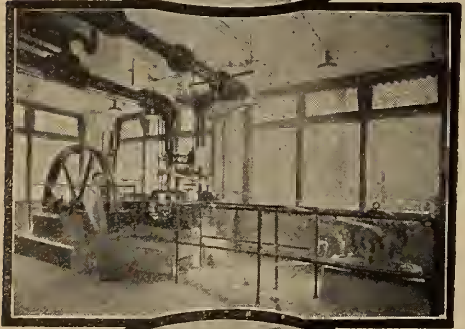

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All Colors for All Purposes

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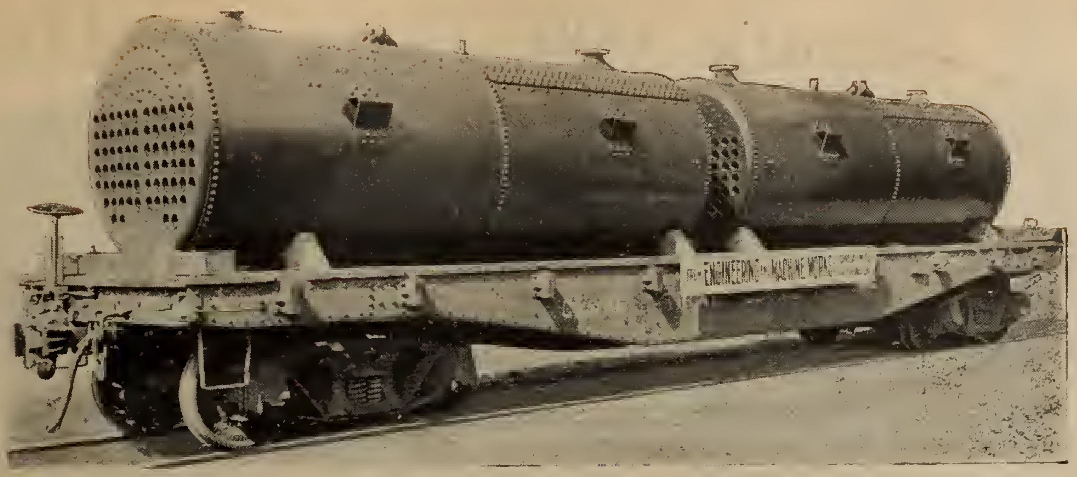

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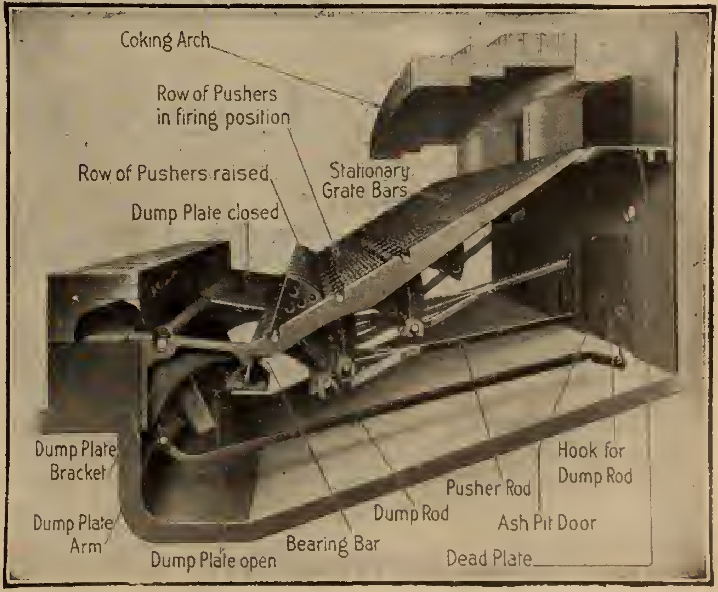
The National Hand-Fired Stoker—what it does

The National Hand Fired Stoker consists of a system of downward sloping grate bars, fuel pushers, dump plates, boiler front, bridge wall and ignition arch. In firing all that it is necessary to do is to dump the fuel on the upper end of the grate and when this is coked it is moved a stage further down by means of pusher rods operated from the front of the furnace, and a fresh charge of fuel may be dumped in. No need to spread the fuel—any "green" hand can thus do the firing. The successive pusher rods keep the fuel marching downward, ensuring perfect and smokeless combustion, until the lowest or dump grates are reached. The draft is evenly distributed throughout the fire bed and excellent results can be secured with waste and low grade fuels. You get all the advantages on a small scale, and without the great cost, of the large mechanical Stokers.



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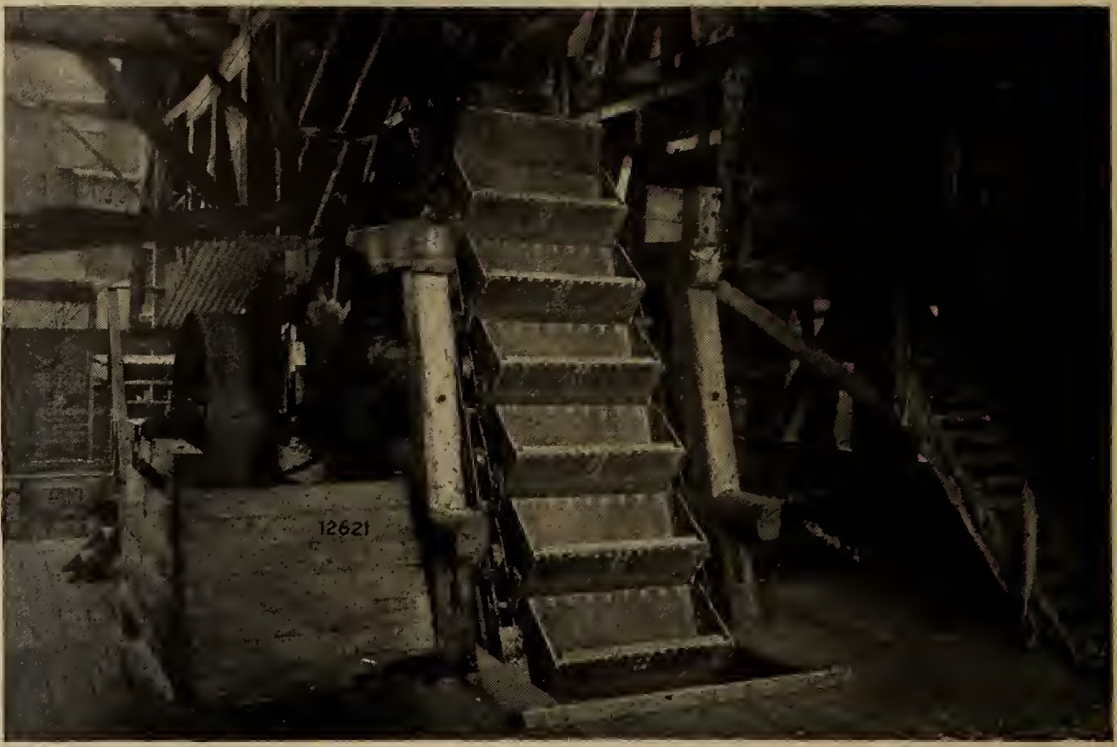

No. 1076 knuckle chain used on Elevator installation pictured above

Jeffrey Heavy Duty Elevators

are designed for the hard service encountered in the handling of such materials as Ores, Stone, Cement Clinker, etc., and have been made to handle 700 tons per hour.

The installation shown above has heavy 60 in. x 18 in. x 30 in. Steel Buckets mounted on all Steel Knuckle Chain, and was built to handle a capacity of 590 tons of stone per hour.

Jeffrey Labor-Aiding Equipment includes a complete line of Elevators; Chains; Sprockets; Conveyors of various types; Portable Loaders and Unloaders; Portable Belt Conveyors; Coal and Ashes Handling Machinery; Skip Hoists; Crushers; Pulverizers; Shredders; Coal Mining and Tipple Machinery; Ventilation Fans, etc.

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MATERIAL HANDLING MACHINERY

THESE CRANE VALVES FOR HIGH PRESSURE DUTY HAVE GIVEN LONG, FAITHFUL SERVICE IN THIS POWER ROOM

HIGH PRESSURE FITTINGS AND VALVES

Crane extra heavy fittings for high pressure work are made of cast steel, carefully proportioned for uniform strength and endurance. Crane high pressure valves have renewable monel metal seats and stems of rolled monel metal. They are so designed as to make it possible to pack the stem when the valve is open, under full working pressure. Like all other Crane valves, they must pass a hydraulic pressure test before leaving the works. The installation of Crane equipment is an assurance of dependable service over a long period at minimum cost for upkeep.

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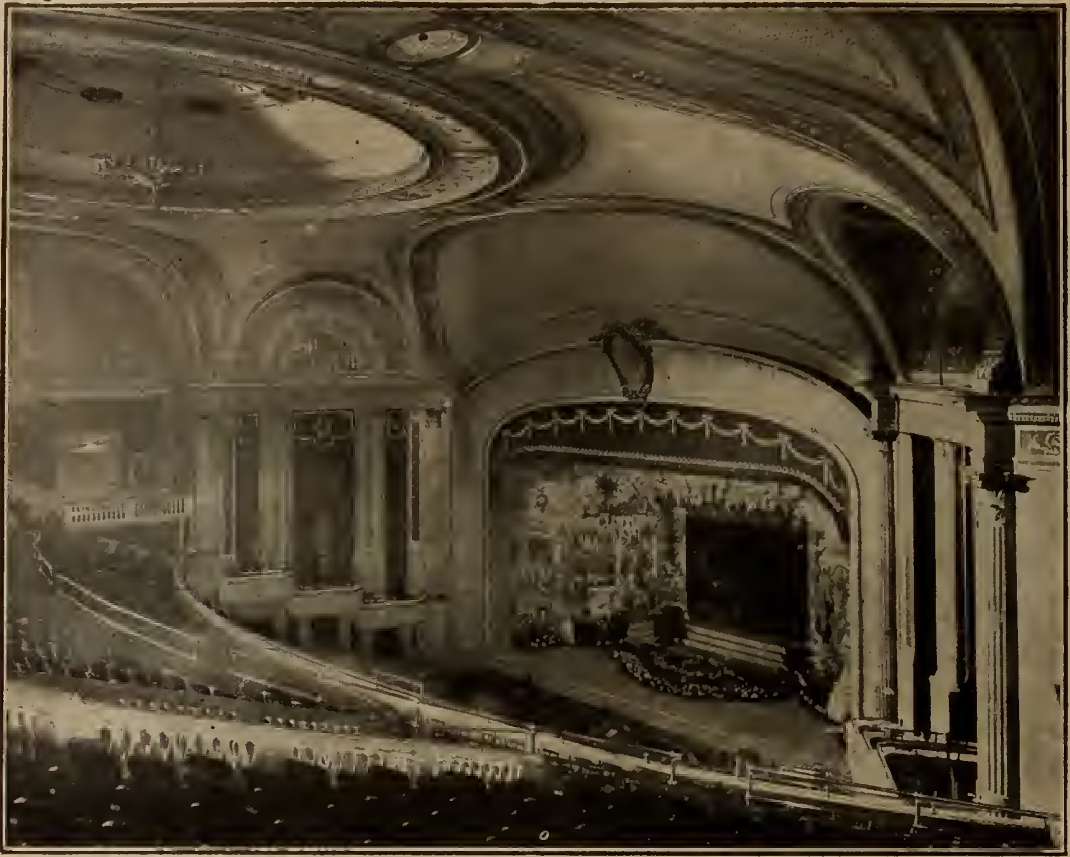

**Loew's Uptown Theatre
Toronto**

Architect:
Thomas W. Lamb

Contractor:
P. H. Secord & Sons Construction Co., Ltd.

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For Modern Theatre Construction

The use of Natco Enclosure Wall Tile effected a saving in masonry costs and facilitated speed of erection on the following theatres:—

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Famous Players Danforth,	Toronto
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Loew's Uptown,	Toronto
Loew's Theatre,	Hamilton
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Loew's Theatre,	Ottawa
New Theatre,	Oakville
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NATCO Enclosure Wall Tile

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Factory: Hamilton, Ont. : : Dominion Bank Building, TORONTO

MERCHANT BARS—Rounds, Squares, Flats, 6 inches and under in width. STRUCTURAL STEEL SHAPES—including Beams, Tees, Zee Bars, Angles, Channels, etc., for structural and fabricating purposes, having section weighing up to 15 pounds per lineal foot.

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CANADA CEMENT BUILDING MONTREAL CANADA

MUSSENS M LIMITED

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You can see in the cut above the extreme simplicity of perfect paving with Heltzel Steel Forms.

Just a series of 12-foot steel rails (4, 5 or 6 inches deep), slotted every 12 inches for division plates and supported by pedestals at all rail joints.

Note those division plates—a long wing at each end to hook rigidly down through the slots in the side rails. Division plates can be removed without disturbing side rails.

Note how snugly the rails meet end to end in a perfect joint, rigid and tight and supported top and bottom by the pedestals held securely by flat steel pins to prevent creeping.

Write today for Bulletin No. 34-F illustrating and describing all types of Heltzel Steel Sidewalk Forms.

The Heltzel Steel Form & Iron Company, Warren, Ohio

Manufacturers of steel forms for sidewalk, curb, curb and gutter, integral curb and base and concrete roads

Our Sole Canadian Representatives:

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SMITH MIXERS

on the job you know that the Contractor believes in High Quality Equipment. The kind that is going to give him 24 hours of mixing every day, if he wants it.

He is not going to have any delays through breakdowns because he knows the value he gets when he buys a Smith.

We make them in Montreal and we know what goes into them. That is why they are guaranteed:

Buy a Smith and stop worrying

MUSSENS LIMITED

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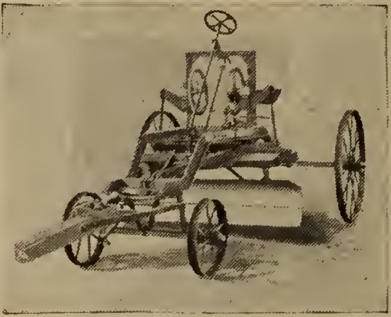
Here is What You Need for Earth Road Maintenance



The Midget, smallest of the Western grader family

An ideal maintenance tool for dirt roads. A 1-man, 2-horse machine with 5-foot or 6-foot blade and practically all the adjustments of the large blade machines.

Let us send you full information regarding this useful Western tool and its deserved success.

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Stocks Carried at Toronto

Western

That's Why

Western Midget in Minnesota Road Maintenance

MUSSENS M LIMITED

When Beckwith Ripped Up The World's Greatest Highway

Fifth Avenue, New York, Looking South from 47th Street

When C. D. Beckwith, Inc., of New York, faced the job of repaving Fifth Avenue, between 42nd and 59th Street — the world's most congested highway — he realized, that in slicing up the old asphalt pavement after years of traffic had pounded it down, he must have the best shovel built — a mistake would be fatal. Speed was essential and breakdowns too costly to contemplate. He already had a good shovel on the job. But he replaced it with a better one — a new **Bucyrus 20-B**

It will pay you, too, to make success certain with the 20-B

The Trucks Move Faster Under a 20-B

Also with High Lift, Sewer, Dragline, Clamshell or Crane Equipment

BUCYRUS
Small Revolving Shovels are built in following sizes:

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30-B—1, 1⅓-yard.
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Also as Draglines, Clamshell Excavators, Cranes, Etc.

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AND STATE WHICH SIZE YOU ARE INTERESTED IN

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Established in 1880
A Special Plant Devoted Exclusively to Small Revolving Shovels
Railroad Type and Revolving Shovels of all sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

524

Mussens Limited, Montreal, Que.—Toronto, Ont.
Dominion Equipment & Supply Co.
Winnipeg, Manitoba

Domtar pavement—Constant Spring Road, Jamaica, B. W. I. Built 1922

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The increasing use of Domtar everywhere is recognition of its many superior qualities. Domtar is the very finest bitumen and provides a community with the means of obtaining good roads at moderate cost.

Every municipal official who is interested in road-building should have the facts and figures about Domtar on file. They will gladly be sent on request.

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One part of Spanish Road, Jamaica, built with Domtar

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No. 56 H Clay Digger

No. 156 H Trench Digger

No. 156 H Picking Clay in Trench Excavation.

Modern Labor Savers

Pneumatic Clay Diggers
Pneumatic Trench Diggers

Ingersoll Rand Diggers are pneumatic picks which enable the men to loosen from five to ten times as much clay or hard dirt as they could with ordinary hand picks.

The Clay Diggers are extensively used in tunnel work through clay. They speed up this work and reduce costs as much as 40%.

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These tools are proved labor savers. Ask for actual figures on their use.

Other Ingersoll-Rand labor savers include, Pneumatic Backfill Rammers, Calking Hammers, Paving Breakers and Jackhamers. Write for Bulletins.

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Refer U. S. enquiries to Ingersoll-Rand Co., 11 Broadway, New York

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Ingersoll-Rand

Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied

Appearance of Concrete Block Building after fire was completely extinguished

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CONCRETE
FOR PERMANENCE

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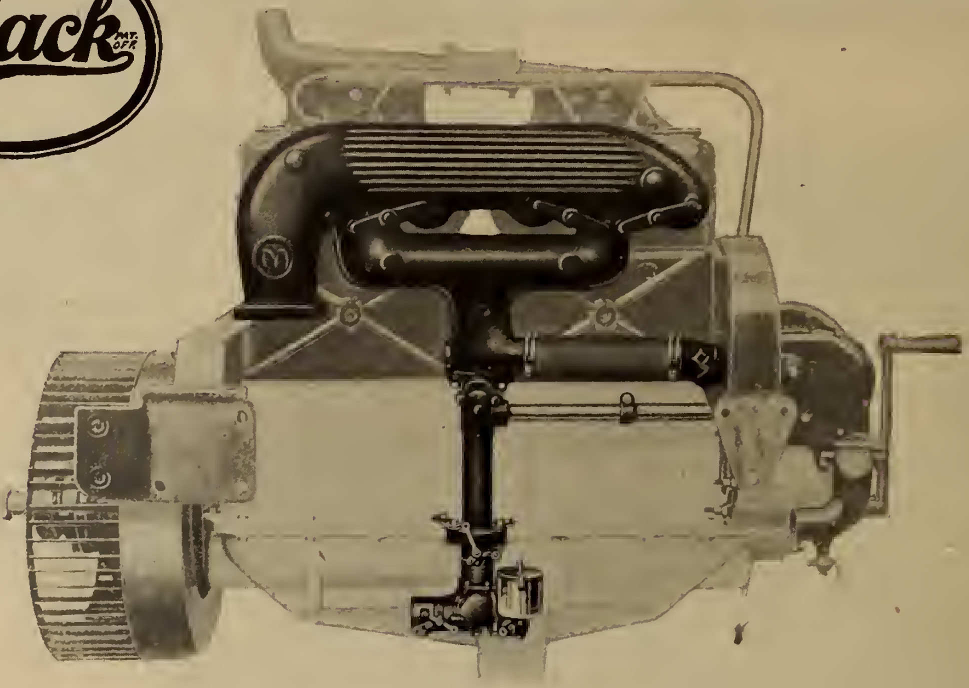

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A Practice to be Emulated

In pleasing contrast with the action of the council of the town of Thorold, Ont.—recently referred to in the Contract Record—succumbing to local influence in the awarding of municipal tenders, the city council of St. Thomas, Ont., has succeeded in overwhelming those political influences that would break faith with contractors who bid on a sewer job in that city a week or so ago. An outside firm, vouched for as responsible and experienced, submitted the low tender $22,637, just $338 below the lowest local bidder, and was recommended for the award by the committee that considered the tenders.

As might have been expected, however, it was not without a struggle that the committee succeeded in having its recommendation carried. Three of the aldermen vigorously supported the local contractor, laying special stress on the fact, of course, that the difference in bids was only $338. Their plea, however, was splendidly counteracted by the chairman of the committee, Ald. Curtis, who stated that, while he would have liked to have seen a local contractor get the award, he felt that the city was duty bound to give the contract to the outside firm in view of the fact that it was the lowest bidder. If the lowest tender was not accepted and preference given to the local firm, he stated, the city might experience difficulty in the future in securing tenders from outside firms when they were desired. Ald. Curtis pointed out further that the awarding of the contract to an outside firm did not mean that local labor would not be employed, inasmuch as the contract called for the use of local men except for special requirements. The arguments of Ald. Curtis, backed by the support of the committee and of the city engineer, won the day against the efforts of the jugglers who would forget their duty because of political exigencies.

St. Thomas thus wins the respect of the contracting fraternity. They know that St. Thomas means to stand by and play fair with all bidders on municipal work, irrespective of their business address. With the system of awarding work to local firms they have no quarrel, provided this restriction is always specified when tenders are called. But when bids are to be open to all and sundry, the lowest responsible tenderer has the rightful claim to the award. St. Thomas in accepting this principle has shown itself a city to be emulated.

Immigration Regulations to be Revised

New immigration regulations, as announced by Hon. J. A. Robb, minister of immigration, should help to augment the supply of both skilled and unskilled building labor, the shortage of which for some time past has been a source of trouble and worry to all contractors. Heretofore, the restrictive immigration policy of the Dominion government did not help to increase the ranks of building mechanics in Canada, even though there was an urgent need for labor of that character. This scarcity of mechanics, which has been so pronounced this past year, was further aggravated by the almost wholesale emigration of skilled men to the United States, where the need was even greater than in Canada and where, in consequence, wages went almost sky-high. Recent reports, however, state that the tide has ebbed and that the direction of flow is fast reversing. This fact, coupled with the policy of a wider opened door for immigrants to Canada, will accomplish much toward filling up the depleted ranks of building labor and making it possible to carry out unhampered the big construction program that is awaiting only a propitious moment for its commencement.

Hon. Mr. Robb's statement, as reported in the press, indicates some relaxation of the restrictions that have been operative up to the present. "It is believed," it is stated, "that the time has come to extend operations with a view to encouraging the migration of the largest possible number of those classes that Canada can now absorb. While there are some would-be immigrants into Canada who are not suited for the Dominion owing to physical, moral or

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Canada's Engineers—K. S. Pickard

Kenneth S. Pickard, who has built up a large engineering and land surveying practice in the East, graduated in 1913 at the age of 24 from McGill University in mechanical engineering with the degree of Bachelor of Science. Prior to his entering McGill he was educated at the Sackville, N. B., high school and Mount Allison University. He received his first insight into practical engineering work when during the vacations in his university course he was engaged on construction work, surveys, etc. After graduating he became engineer in charge of rock construction on the Prince Edward Island car ferry terminals at Cape Tormentine, N. B., being employed by the Sackville Freestone Company, Ltd., who were sub-contractors on the job under O'Brien, Doheny & Company, general contractors. Mr. Pickard held this position until 1916 when he became superintendent of stores and shipping for the division of gauges and standards, Imperial Ministry of Munitions, Ottawa, under Captain R. J. Durley. During 1918 and 1919 he served as lieutenant in the Canadian Railway troops. After this military service he entered private practice as an engineering and land surveyor in Sackville, N. B., being associated professionally with Walter J. Francis & Co., consulting engineers, of Montreal. As a consultant, Mr. Pickard has undertaken professional work on surveys for various firms and corporations among them being the town of Sackville, New Brunswick Department of Lands and Mines, Panuke Pulp & Power Company, Windsor, N. S., and Hollingsworth & Whitney, Ltd., paper manufacturers of Boston, Mass.

In addition to being an associate member of the Engineering Institute of Canada, and a registered engineer of the province of New Brunswick (civil and mechanical branches), he is a member of the council of the Association of Professional Engineers of the Province of New Brunswick, provincial land surveyor of the province of Nova Scotia, and a deputy crown land surveyor of New Brunswick.

Mr. Kenneth S. Pickard

industrial unfitness, or because they belong to races that cannot be assimilated without social or economic loss to Canada, there are at the same time in Great Britain and Continental Europe tens of thousands of skilled and unskilled workers (not agricultural) who would be an asset to Canada if steady employment could be found for them."

Hitherto, the immigration to Canada has been restricted to British and United States citizens and agriculturalists only from other countries. The new policy apparently opens the door to immigrants of other types than farmers from countries other than British possessions and the United States. The advantage this will have in improving the labor supply in the construction industry is obvious. Undoubtedly there are large numbers of skilled and unskilled workers who are only too anxious to settle and take up occupations here.

The department of immigration, however, is alive to the need of careful selection of immigrants and in its statement remarks: "An adequate immigration policy must recognize that while Canada requires increased population, quality, rather than quantity must count; that British immigration must hold first place in the program; and that the selection of Canada's settlers must have due regard to physical, industrial and financial fitness and the Dominion's power of absorption. The open door policy will prevail for those classes likely to succeed and for whom there is demand. In the interest of the immigrant and of Canada, determination of fitness will, as far as possible, take place before the immigrant leaves his own country. Facilities will be offered for the immigration of such skilled and unskilled labor (other than agricultural) as Canada may require from time to time."

The announcement of this policy is especially oportune at this time, as it makes it possible to have the labor situation clearly defined before the next construction season commences. There ought soon to be indications that, as a result of the new policy, the ranks of building labor will be increased from overseas immigration and contractors can then lay plans for a busy season next year.

Trade Index of Canada

The Canadian Manufacturers Association, through its Commercial Intelligence Department, has just issued a new edition of the "Canadian Trade Index," a book of some 900 pages, priced at $6,000. It is divided roughly into four parts (1) an alphabetical list of manufacturers, with addresses etc., (2) a directory of the manufacturers classified according to articles made, (3) a directory of exporters, etc. (4) an alphabetical list in French of the headings in part 2.

Should the Road Building Industry be Publicly or Privately Owned?

Arguments Are Advanced in Favor of Public Ownership of Street Paving Facilities—Many Defects of Private Control are Eliminated.

By CHAS. A. MULLEN*
Consulting Paving Engineer and Director of Paving Department, Milton Hersey Co., Ltd.

The subject of this paper is one upon which I ought to be considered qualified to speak with some authority. I think my first job in the street and road making industry was that of counting old granite blocks as they were being thrown into a truck from the streets of New York, preparatory to the putting down of a new pavement. We were rather particular about counting them and getting a proper receipt, for there was good reason to suspect that after that they were being stolen by one of the officials of the city of New York and sold to other contractors for out-of-town work. That was many years ago.

Up through several stages I struggled, or was pulled, until I was superintendent for a contractor, and then a contractor myself, which work I left to become a city official in charge of street work. My present practice as consulting paving engineer brings me in contact with many municipal and other governing bodies, and the contractors doing business with them; occasionally, I regret to say, just plain "doing" them. Now what should I report to-day if one of my clients asked me to prepare an estimate for a large street paving job, located in the capitol city of Canada's great neighbor, for instance.

The City of Washington is selected because I am busy these September days, and Major F. S. Besson, assistant engineer commissioner of the District of Columbia has recently been kind enough to publish a book entitled "City Pavements" which supplies me with exactly the figures I want for the purposes of illustration; but Washington might just as well be New York or Toronto or Buffalo or Montreal or Charlottetown, P. E. I., as far as the general facts are concerned. It would only be necessary to apply the local cost figures for labor and materials, and the rest would be about the same.

In Major Besson's estimate, after figuring the costs for materials, labor, supervision and overhead, in fact, al the knowable costs, he adds ten per cent. for contingencies and then fifteen per cent. for contractor's profit. Not contractor's wages, mind you, but profit; for, if the contractor has actually worked as a superintendent or manager or even president of his own corporation, he has usually not overlooked paying himself generous wages or salary for his actual sweating at the brow, and charging it in as overhead, before figuring his fifteen per cent. profit. That is what good business men like you and I would do were we in his place.

The Profit Saved

Between buyer and seller, fraud sticketh as mortar between bricks; at least, so says the bible. Now for the moment, let us assume that the bible is wrong in this statement, and that both the contractor and the city officials are strictly honest, which I believe is often the case. Then the difference between the public and the private ownership of the street paving industry of the city of Washington is the contractor s fifteen per cent. profit plus a large part of the ten per cent. contingency item and a very considerable part of the overhead, say at least twenty per cent. in all.

Not unwisely did I select the case of the city of Washington, for few there are who will be so bold as to state that the Engineering Corps of the United States Army, which built the Panama Canal under General Goethal's public ownership after private ownership of the canal building industry at that point had failed, and to which army engineering organization Major Besson belongs, is incapable of efficiently organizing and operating a publicly owned street paving industry for the city of Washington; or for the United States of North America for that matter.

Men will not work as well under public ownership of an industry as under private ownership, is an argument frequently advanced. My own experience has been to the contrary. I have been able to get the same quantity of work and of better quality from men through publicly owned industry than through private, both at times when I was in charge as a city official and more recently when as consulting engineer I have assisted in directing the execution of street paving programs.

Does a City Have to Pay Higher Prices?

Higher prices for materials will be paid by the publicly owned industry, is another argument frequently advanced. From my own experience, I know that a public body can purchase as cheaply or more cheaply. Of course, monopoly combinations are sometimes made against the public. Montreal was recently face to face with what seemed to be a monopoly in sand. The Administrative Commission very quickly purchased a sand pit; and, to-day, monopoly in the supply of that material is broken definitely by the public ownership of a unit of the industry sufficient to supply the city's needs.

Publicly ownership can, if it will, employ the best managers and workmen, purchase the most suitable plant and materials, and proceed with the work precisely as does the contractor, or better; and in doing so, it eliminates, as I said before, not only fifteen per cent. profit, but the contractors overhead cost of competition, private financing, bonding, and much of the risk. Moreover, a publicly owned industry, being based on the solid foundation of service, and having a monopoly that is both legal and just, can safely make a larger investment in plant and machinery and in the continuous services of competent men.

But public ownership will not, says a very intelligent Montreal contractor who does not agree with me on this point; and he recites many of the ills of publicly owned industry,—patronage, indolence, lack of interest on the part of some of those in charge, and so on. Well, we who constitute the public have got to see that public ownership will and that it does; if we do not, it is our own fault. Public ownership did in the case of the Panama Canal; and, when we are ready for it, so it will do in other lines of work such as the building and maintaining of roads and streets.

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*Before the Public Ownership Conference, Toronto, Sept. 12.

To the taunt that I am not working directly for the public, I can only reply that I wish I were. It is the public's fault that I am not. It so happens that the head of our firm is working directly for the public, for Dr. Milton L. Hersey is one of the Harbor Commissioners of Montreal; he can afford that luxury. As co-administrator of so large a unit of public ownership as the Harbor of Montreal, it is needless to say that he is a believer in public ownership properly administered in at least some lines of industry; even though it may be his good fortune to be somewhat overburdened with considerable private ownership.

Treat Contractor Fairly

But once we award a contract, the contractor is entitled to every courtesy and assistance from public officials. I have never had any sympathy with the contractor-baiting engineer, who draws an agreement which he himself could not live up to were he undertaking the work directly by day labor, and then proceeds to make the life of the contractor miserable. In such instances, in fact, I have a considerable sympathy for the contractor, who, being quite human, proceeds to "do" the engineer. I have in mind such an engineer under whom I worked as a contractor; and my one regret is that the public pays the piper.

When waste and inefficiency are the order of the day under the public ownership of an industry, the political conditions are usually such that private ownership of the same industry would be both corrupt and wasteful. Under public ownership, the electorate has some chance to correct the bad management, the post office for instance, while under private ownership of the coal mines we seem to have a very hard time making corrections. Moreover, a privately owned industry that is mismanaged is usually found financing the fight to maintain the status quo with part of its ill-rotten gains.

Private ownership of industry is always wasteful from the public's point of view. There is much wasteful duplication of plant, management and financing; and where a publicly owned paving industry could afford to install very modern equipment and management, because of its monopoly, the same paving industry, owned as several units by competing contractors, each controlling only a small fraction of the work and having but a doubtful control of that, cannot afford the same general efficiency, though each unit may be quite efficient when considered separately as such.

Better Control of a Publicly Owned Industry

A manager may be selected under public ownership of the road making industry; while, under private ownership of this industry, the public governing body usually has to accept whoever blows in with the lowest financially responsible bid. When a road making contract is awarded to-day, it is seldom an arrangement between persons, it is rather an arrangement between a public body and a bunch of money sufficient to finance the contract, and here arises an interesting point.

The cost of financing work is generally duplicated under the contract system. The contractor, in bidding, must estimate his cost of financing the job. Usually, the public funds are in the bank waiting to pay him as soon as the job is completed. The bank is paying the city anywhere from zero to three per cent. interest on the money, and the contractor is borrowing the equivalent of the city money from some bank at six per cent. plus to pay for labor and material. Under public ownership, the money is immediately paid for the labor and material, and the cost of private financing, often a very expensive item to a firm not financing strong, is entirely eliminated.

Another item of waste under the contract system of doing street paving came to my notice very forcefully last year; the non-efficient use of the available equipment due to dividend managements. It happened that, in the same month, one contractor with a plant in the north end of the city of Montreal hauled material about ten miles across town to lay it almost at the other's doorstep, while the second contractor hauled identical material from the west end of the city to the north. Ninety per cent. of this hauling was waste.

No contract and specifications, in the way they are known to the contract system, are necessary in a privately owned industry. This does not mean that plans and requirements are not necessary; but what is needed is drawings with sufficiently clear explanations or descriptions. A city engineer in this very province not long ago told me the cost to him of building cement sidewalks and curbs by day labor. It seemed rather low, and I asked him for the specifications. He told me that he had none, and did not need them; but he showed me his drawings and sketches with explanatory statements on them. His reply was: "We have the accounts of material and labor, and, as far as the dimensions are concerned, you can go out and measure the job." This man's work is notoriously good, so I did not bother making further investigations.

No Litigation

There will be no law suit between the city and the cotractor on this work, because there is no contractor, and it takes two to make a quarrel. Neither will there be any extravagant claims for extras. The publicly owned industry builds for use, not for profit; while the contract industry builds for profit first, that is its motivating power. Public ownership accounts are usually open for all to see—that is as it should be; but private industry is usually very jealous of its records.

I usually have to explain that I am not an unfriendly critic to contractors; what I do criticize is the contract system as such. Contractors are men just like you and me, not much different; and, as long as we indulge our indolence to the extent of employing the contract system in our industry, the contractor is entitled to his ten or fifteen per cent. profit, or whatever legitimate competition will give him. It is our fault if we pay this extra amount in order to get our work done in this manner.

The contract system lends itself to much abuse. So far, we have been discussing the contractor who is rated as an honest man, as honest as you and I; but, unfortunately, the business lends itself to some very shady transactions. We have our patented pavement monopolies, and our material monopolies, and we sometimes have arrangements among contractors by which they eliminate the competitive element and arrange their prices to suit themselves. Moreover, the politico-contracting ring is ever with us, and the concessions in exchange for contributions are only too well known.

One government chases the other out of office by pointing to its questionable practices in connection with road contract work; only, as a rule, to substitute equally questionable practices of its own. The criticism of the last Ontario governments' road practices had much to do with its defeat; and what old state of the Union has not had its investigations and upheavals from the same causes.

Political Catering

Public ownership does not bribe public bodies. Did you ever hear of a municipal electric light plant or any other municipal industry trying to bribe the city council or offering any party a campaign fund? A small contribution from the individuals of such an industry levied by the party in power is about the limit. Have you ever heard of the bribery and corruption in connection with street railway franchises or street paving contracts? I do not need to ask the answers to these questions. An incorrect system produces undesirable results, and private ownership of industry has about thoroughly proven itself incorrect. Human nature cannot stand it.

The Hydro-electric Commission of the Province of Ontario is in a fair way to solving its problem, despite poor old human nature. My own view is that we need many other such commissions, and one of them should be a road and street making commission that would have its organizations centrally located throughout the province to serve both its own needs for provincial highways, county needs where such are required, and municipal needs as well. There should be an Ontario road making and paving industry, "dirt" contractors eliminated as such and hired as managers where competent ones will accept employment.

As a matter of expediency, public ownership cannot be profitably installed unless the public body or federation of public bodies can command and use the output of an economical unit of the industry involved. A very small town cannot afford to purchase a portable paving plant to use but once or twice in ten years; though the county in which it is situated might advisedly purchase such a plant and perform the work for its several towns; or, a province might own a number of plants, and operate them for provincial highways and village and city streets as well.

Public Ownership in Charlottetown

As a matter of necessity, Charlottetown, P. E. I., decided to publicly own its street paving industry. It was so far away from the usual contracting centres for this work that no contractor seemed anxious to go there and pave its streets at a reasonable price. Charlottetown purchased its municipal grading equipment, its municipal concrete mixers and its municipal asphalt plant, secured the few expert men necessary, and proceeded to do the work itself. We have yet to hear of a city, even better situated, which has done better for itself through the contract system than conservative little Charlottetown has done through the public ownership of its own street paving industry.

A matter of good business, the Charlottetown taxpayers and public officials would tell you as they compare the costs under their publicly owned street paving industry with those under the contract system of surrounding towns and larger cities that may try to look upon them as provincials. It is good business for the public, conducted by a good business administration; not good business for the contractors who might have been adding very much to the cost of this work with no increase in its quality. Should you tell a native of conservative Charlottetown that his city had done anything radical, he would laugh at you.

"Business—Ancient and Modern" is the title of a pamphlet that I recently received from Mr. J. C. Trautwine, Junior; the man who edits the Civil Engineers' Handbook that we all know so well. In this article, Mr. Trautwine points to private ownership as the ancient and to public ownership as the modern method of handling community business; and shows the really rapid acceleration, as viewed by Father Time, of the change from one to the other that to some of us seems so slow when measured in terms of our own day and generation.

In the province of Ontario the change from the ancient to the modern is going on apace. Behold the Ontario Hydro-Electric. Behold the Toronto Street Railway. Behold Toronto, Hamilton, London, St. Catharines, Brantford and other Ontario municipalities owning their own paving plants and building and repairing their own streets. What is needed next, it seems to me, is an Ontario Road and Street Building and Maintenance Commission which will co-ordinate the public ownership work already done along this line and rapidly extend it.

To summarize the situation, it may be said that a publicly owned street and road making industry will have at least the following advantages to the public over a privately owned industry:

1. Contractor's profit is eliminated.
2. Cost of competition is eliminated.
3. Overlapping of work is eliminated.
4. Duplicate financing is eliminated.
5. Cost of litigation is eliminated.
6. Bribery and corruption is eliminated.
7. The risk or contingency item is reduced.
8. The overhead charges are reduced.
9. More modern equipment is practicable.
10. Suitable managers can be secured.
11. The profit is the public's.

As a concluding statement, I shall merely quote the words of Major-General George W. Goethals, after he had completed the Panama Canal by direct labor, without the assistance of the contract system. He said: "I would do it all over again the same way." And one of the contractors who had bid on the work, afterwards declared frankly that it was being done more cheaply and more expeditiously than would have been possible under the contract system. If the publicly owned canal industry could succeed so well, why do we still believe that the contract system of privately owned industry is necessary or advantageous to the public in our road and street making industry?

What Determines the Cost of Truck Haulage?

To Figure out the True Cost of Motor Truck Transportation Requires the Analysis of a Large Number of Items, Many of Which There is a Tendency to Overlook

There can be nothing gained by comparing a horse with a motor truck as far as the first cost is concerned, because even a small truck costs a great deal more than the average truck horse. However, comparisons between muscles and machines rarely amount to much, because muscles can do just so much work and must rest, while machines, within certain limits, do not need a recuperative period.

While it is true that business men ordinarily are too ready to establish their idea of the efficiency of this or that machine by its cost, it might be well to start out in this discussion of the value of motor trucks to first establish the comparison of costs between horses and motor trucks.

A two-horse team and wagon costs approximately $1,000 and possibly more. The chassis of the average two-ton motor truck costs $2300 or $2400, and from there on up to a possible $4,500, for a five-ton truck. It begins to look black for the motor truck, because nine or ten horses could be purchased for the price of one five-ton truck. It begins to look even blacker when we figure that from $4.00 to $6.00 per day a horse and wagon can be maintained, and that it costs between $15.00 and $25.00 a day to keep a five-ton truck operating.

On the costs sheet then it appears that the motor truck is considerable of a liability. However, the question of service and actual work must be taken up. A horse is slow and a motor truck is fast, and therein lies the whole secret of truck profitableness. A truck can easily average from 60 to 75 miles per day, while a horse at best can travel but 20 miles a day with a possible reduced average to 15 miles.

One lumbering firm, for example, used four-horse teams to haul logs making five trips, totaling 15 miles a day with 2,000 board feet for each trip, or 10,000 feet in a day. The firm bought a four-ton truck which had the same capacity, 2,000 board feet on each trip, and it makes 20 trips a day. In a single day that truck carried 40,000 feet of lumber or four times as much as the horses. This is a vivid example.

Items of Cost Often Omitted

Too often in measuring up the cost advantages of one type of equipment against another, certain essential cost factors are omitted with the result that an unwise decision is made. This is particularly true with motor trucks.

Let us first consider the matter from the standpoint of the company which is at present operating one or more motor trucks and would like to determine the complete unit cost of such hauling. This is, no doubt, the best way in which to explain the various items of cost which should be taken into consideration, and at the same time methods of economizing on various phases of motor truck maintenance can be suggested.

Each company's requirements for figuring costs must necessarily differ, since conditions vary in each case. Yet all must include the following items when they represent expenses incurred or apt to be incurred in the concern's hauling system:

Fixed Charges

- Amortization (reserve for depreciation).
- Interest on investment.
- Insurance:
  - Fire, transportation and theft;
  - Public liability and property damage;
  - Collision.
- Taxes.
- Licenses.

Maintenance Charges

- Garage: Rent, heat, light, power, etc.
- Repairs: Materials and labor.
- Tires.
- Painting.
- Overhauling.
- Overhead.
  - Administration requirements.

Running Costs

- Gasoline.
- Oil.
- Wages of drivers.
- Grease, kerosene and waste.

Selecting the Cost Unit

Various units of operating cost may be used to permit cost comparisons, and each has its special advantages. While a discussion of these different units and the reasons for them would reach lengthy proportions, it may be said in general that the standard basis adapted by best motor truck authorities is established by use of the following formula:

$$\frac{\text{Average round-trip distance}}{2} \text{ x total units} = \text{unit miles.}$$

$$\frac{\text{Total cost}}{\text{Unit miles}} = \text{cost per unit mile.}$$

The process of figuring this cost is relatively simple. The "unit" refered to in the formula is the unit of load. Thus the method of applying the above would be as follows: Decide upon a formula period, say a month, to compute the cost; each day, make a total of the number of miles covered; divide the number of round trips made and the number of miles covered; divide the number of round trips made in a month by 2, as it is presumed that on half the trip the truck is empty—in any case this method allows for pick-ups, since frequently a truck discharges part of its load en route to its destination; multiply this figure by the total units hauled in that month which will give the number of unit miles per month; the total operating cost per month, divided by this figure, gives the cost per unit mile for that month.

Items under "running costs" are important as they lend themselves to effecting economies if they are closely watched. At the same time, they are perhaps the simplest of all to keep track of since they may be easily charged from day to day against each truck in accordance with the truck's requirement.

An extremely satisfactory method for recording these costs and one that involves the least effort is to provide each driver with a monthly report form on which he may enter each day's requisitions for gasoline, oil, cup grease, kerosene, waste, etc., at the end of that day. This form should provide a space in which drivers' and helpers' wages can be inserted at the end of the month.

Monthly totals of running expenses may be readily checked by garage receipts, invoices, etc. It is important above all to minimize the amount of clerical work required of the driver, principally because many drivers are not capable of handling complicated systems accurately and because their full time is needed in making deliveries. In some cases, according to the size of the business and other conditions, it is sufficient to compile the monthly records of running costs from garage reports.

Finding the Fixed Charges

The fixed charges incidental to truck operation are those which, with one exception, do not vary from day to day—that is, they go on whether the truck is in use or not. This one exception is amortization (the reserve for depreciation). The other fixed charges are interest, insurance, and license fees.

Amortization: Every manufacturer, regardless of how he expects to use his trucks or how many trucks he expects to have, should take amortization into account in figuring the cost of operation. This is the term applied to the practice of charging a certain sum against an investment for every unit that affects its life so that when the investment is no longer in service, sufficient funds will be available to duplicate it. In other words, amortization is the reserve for depreciation.

Several years ago it was common practice to amortize motor equipment on a basis of time, but this method, according to best authorities, is now practically obsolete. The accepted modern method of amortizating a motor truck is on the mileage basis. Expected mileage of each truck in question is determined, and then the original investment is charged to the cost of operation at specific periods on a basis of the number of miles traveled.

The estimated mile life of the truck varies, of course, with the quality of the truck and the use to which it is put. In the case of truly high grade vehicles, it has been found that 300,000 miles has not been too high. Conservatism, however, places the life of the average truck, for amortization purposes at from 100,000 to 150,000 miles. The amount of the investment is most commonly figured on a net basis, that is, the total investment less the cost of tires, since it is advisable to consider tire depreciation as a separate item.

Interest on Investment: Since the purchase of a motor truck is an investment in the business, it is necessary to take a certain sum of money from the business, either as cash or credit, to pay for it. Like all sound investments, this money should have an earning power of whatever rate it would cost to borrow a similar sum. However, since motor trucks are amortized, the greater the truck mileage the less will be the amortization fund and the less the amount invested. Thus it would quite naturally be unfair to charge interest based on the full original investment during the whole life of the truck.

In order to keep this amount of investment constant and correct, it is advisable most authorities agree, to charge this investment at one-half the current or legal rate.

Insurance: Whether motor truck insurance is carried with an insurance company or by the concern itself, the cost should be charged to the truck. It is unfortunately the case that the concern that does not carry a policy, although it assumes all the risks, seldom enters a charge for insurance. Insurance is a comparatively simple matter when the policy is underwritten by an insurance company. No business man will fail to insure his plant and equipment. Why should he fail to do so with his motor equipment?

License Fees and Taxes: License fees and taxes incurred by the truck should be charged to it. Under this heading the provincial fee, city fee—if any—and also special fees should be charged to the truck.

Maintenance Charges

Maintenance charges, the remaining division to truck operating costs may be said to include garage cost, overhead, repairs—including material and labor—tires, over-hauling, painting, and battery renewal and charging.

These items of maintenance, so called because each is based on the running conditions of the truck, are for the most part self-explanatory. It is frequently found, however, that the truck operatory misinterprets the sphere of one or more of these or else fails to include all items chargeable toward them.

Garage: Obviously, the garage charge is based on the time factor,—that is, it continues whether the individual trucks are running or not, yet it is a charge directly traceable to the truck's use. It may be apportioned as rental equally among all vehicles housed or according to size and type. In some cases the operator keeps his trucks in a public garage which includes space and service, in which event each vehicle should be charged with the expense it incurs. When the manufacturer owns the garage it is necessary to apportion all items that make up its cost, including interest on investment, taxes, insurance, and expenses of upkeep such as heat, light, power, water, etc.

Various methods of figuring each truck's share, when the trucks vary in size, weight, etc., of garage expense could be recommended but for most purposes, it is satisfactory to use whatever method is convenient for the owner. Washing and polishing ordinarily come under the garage item, and each truck should be charged with the cost of the individual work.

Tires: It is commonly accepted as best practice to amortize tires separately from the truck itself, figuring the amortization of the truck on the net investment of the truck minus the tires. The most common method of taking care of the tire charge and one that is satisfactory for most purposes is to divide the original cost by the mileage estimated from experience, or, when an accurate estimate is not possible, by the adjustment mileage. Tire repairs may be taken care of satisfactorily by a direct charge to maintenance, but it must be remembered that an accurate figure of tire cost per mile of operation can be arrived at only after the tire has served its full life and repair charges can be computed.

Repairs: It is generally considered advisable to keep a separate record of chassis repair costs in order to compare various makes of chassis. This is because the chassis will have a direct effect on the body, as a high grade truck minimizes the vibration and the abuse suffered by the rest of the equipment. In order to show specific points of advantage in different trucks, such as accessibility and wearing quality of parts, many truck operators find it advisable to divide repair costs into labor and materials costs.

Although the easiest method of apportioning repair costs is to charge the cost against the truck at the time the repairs are made, this is an exceedingly unsatisfactory method, since it will show an unusually high cost per unit at one time and a low cost at another. This may be avoided readily by distributing the yearly cost in proportion to the monthly mileages. Where it is desirable to make a preliminary study of costs before the truck is purchased, the repair charge may, for this purpose, be estimated.

Painting: As the benefits derived from painting a truck are spread over a long period of time, it is customary to distribute the first cost over that period. In other words, if the truck is painted once a year, the cost should be divided, as in the case of repairs, according to monthly mileages.

Overhauling: Every motor truck requires an overhauling every so often, principally because conditions will be disclosed which can be taken care of immediately to prevent future repairs. It may be said to be general practice among experienced truck owners to overhaul each truck once a year. As in the case of repair costs, this item should be extended over the same period in proportion to mileage.

Miscellaneous: Battery renewal and charging, inasmuch as its benefits are distributed over a definite period, should be charged pro rata, according to mileage, over that period.—From "The Wood Box."

Mr. T. Gilday, president of the Campbell, Gilday Co. Ltd., roofers, of Montreal, died in that city recently.

British Cement is Superior

The London, England county council recently instructed their city engineer to carry out some tests on Belgium cement, of which the council have had no experience in actual use. The results show that, although Belgian cement complies with the requirements of the British Standards specification, it is very high in expansion and fineness, and it was not recommended for use. It was proved that British cement was much superior to the Belgian, inasmuch as a day's test showed the mean strength of the British cement to be 457 lbs., as against 344 lbs. for the Belgian cement.

Trade Incorporations

Eastern Dredging & Construction Co. Ltd, with head office at St. John, N. B, capital $49,000, to carry on a general contracting business, specializing in public works.

Ermac Construction Co., Ltd., with head office at Hull, P. Q., capital $19,000, to carry on a building and real estate business.

A recent registration at Montreal is that of G. W. Michaud & Cie., general contractors. The principals of the new company are Messrs. Geo. W. Michaud and Rosaire Lafontaine.

The firm name of O'Sullivan Contracting & Construction Co., Ltd., has been changed to Desantis & O'Sullivan Contracting & Construction Co. Ltd. The offices of this company are located at Montreal.

Dowling Williams, Ltd., with head office at Toronto, capital $40,000, to carry on a general contracting and engineering business.

The Pawling & Harnischfeger Co. of Milwaukee, Wisconsin, builders of traveling cranes, hoists and excavating machinery, announce the opening of a new office at 1124 Book Bldg., Detroit, Michigan, with James Van Buskirk in charge.

The Week's Developments in a Nutshell

Canadian wheat production 470,000,000 bushels, a record crop; six months mineral production, $87,152,248, also a record; Canada leads the world as exporter of wheat, 40% of the world's total, as compared with the United States, her nearest competitor, with 26%. It is conservatively estimated that this year's crop will mean more than a billion dollars to be spent by the rural communities.

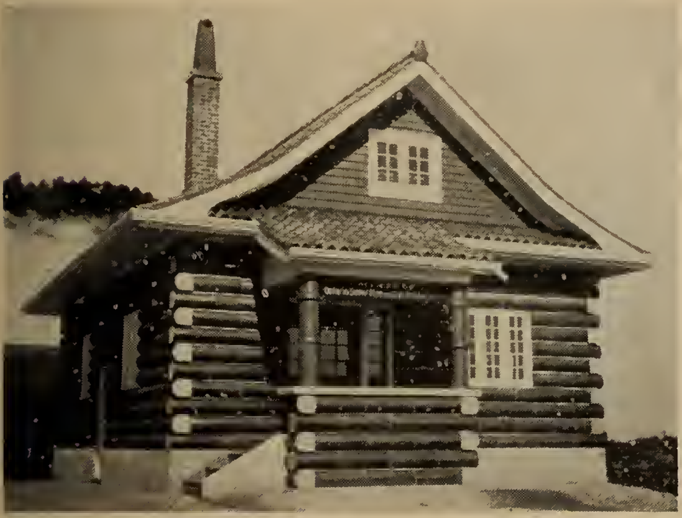
The industrial condition is most encouraging. Mr. Aemilius Jarvis, president Canadian Locomotive Company, says they have orders on hand totaling $2,300,000, enough to keep the plant running at capacity for several months. Mr. Frank P. Jones, president Canada Cement Co., states that production to August 31, 1923, is slightly greater than for the same period last year and he expects the same condition will hold to the end of the year. The cement situation has gradually improved. At the beginning of 1922 there was a considerable surplus. During the year, while production remained practically the same, the surplus was reduced by over a million dollars. However, cement plants are still operating only around 50% of their capacity.

Toronto supply dealers are in an optimistic mood and state that the situation is satisfactory. There has been a seasonal slackness noticeable recently. Prices of building materials have held firm. There has been a tendency to over production in the heavier supplies, such as stone and sand. For the first time in years the prices of steel extras have been advanced. Plain red oak flooring is quoted five dollars down.

Unique Building Imitates Log House

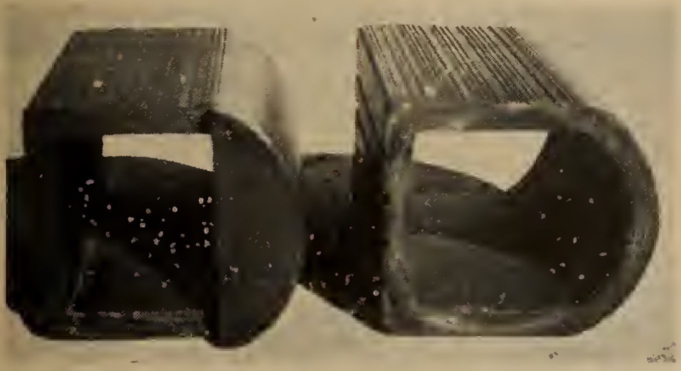
Office for Ontario Sewer Pipe and Clay Industries Ltd. is Made of Specially Moulded Vitrified Clay Sections

An absolutely new and novel type of construction has been adopted by the Ontario Sewer Pipe and Clay Products, Ltd., in the construction of their new office building at Mimico, Ont. The company's product, sewer pipe, specially moulded with three flat sides, was used in the wall construction, giving an excellent imitation of the old fashioned rustic log building, with the added advantages of absolute fireproofness and economy of construction.



Office building constructed of vitrified clay pipe

One of the accompanying illustrations shows, on the right, the ordinary wall section, and on the left, the special section with partly closed end used at door and window openings. The pipe is made in three lengths, the full size section being about 30 in. long, and the others half and quarter sections of this. Difficulty was experienced by the manufacturers in entirely closing the end of the pipe for corner sections, the heat necessary in the process of burning those ends in being so intense that the end warped badly and fell away from the body of the pipe. Quite a simple and satisfactory method, however, is to close the ends with concrete, as has been done in the corner secitons of this building. The company are experimenting further, however, on the burning in of the end and may possibly devise a satisfactory method of doing this.



Special pipe sections for building purposes

A cement mixture has been used for joining the sections and for filling in between the layers of pipe, giving an effect exactly the same as the bleached mud joint in the original log-cabin building.

The flat side of the pipe which forms the interior walls is grooved to receive an interior finish and in this particular case a rough stucco finish coat was applied directly to the interior surface of the pipe.

From an architectural standpoint, the possibilities for this type of construction would appear to be limited to the low type of building, such as railroad stations, summer hotel buildings and residences in some cases. Here, however, its application would seem to be ideal, as it combines, as stated before, the features of economical construction, fireproofness and waterproofness, the heat and cold insulating qualities of the hollow block type of construction and a close imitation of the rustic beauty of the old log structure.

The building illustrated has just been completed by the Ontario Sewer Pipe and Clay Industries, Ltd., contains two large public offices and three smaller private offices, with toilet on the main floor. The roof is in keeping with the general handsome appearance of the building, being of Spanish red tile. The window sash and exterior wood trim is finished with a white enamel. Sewer pipes were also utilized in the construction of the verandah posts. The flooring of the porch and of the entire interior is of red quarry tile. The interior trim is of oak throughout and there is a large brick fireplace located in the front or main office. There is a basement under the rear half of the building where the hot water heating plant and extra W. C. are located.

Mr. Andrew Dodds, president of the company, is solely responsible for the introduction of this new type of construction and has taken out patent rights on the manufacture of the block.

Concrete Extensively Used in B.E. Exhibition

One of the Wonders of the Empire, With Architectural Effects Made Possible Only Through the Use of Concrete

Sir Robert McAlpine, head of the firm of Sir Robert McAlpine & Sons, who are the contractors for the British Empire Exhibition to be opened in April, 1924, gave some interesting particulars recently on the progress of the work at Wembley Park, London.

"If the British Empire Exhibition does not come to be classed as one of the wonders of the world," said Sir Robert, "it will certainly deserve a place as one of the wonders of the Empire. So far it has not been discovered by the general public, but those who have had an opportunity of seeing it even in its present skeleton form are practically without exception tremendously impressed with its size and scope.

Extensive Use of Concrete

"From an architectural point of view it has proved what can be done with steel and concrete. I think

I am safe to say that concrete has been used to a greater extent and in a greater variety of ways at Wembley than in any other building in the world. Everything that it has been possible to make in concrete has been made in concrete. Even the flag staffs are of concrete.

"The effects achieved have to be seen to be realized. We have made no attempt to make the concrete look like anything but concrete, but for a few of the visitors who come to inspect the progress of the work refuse at first to believe that in certain parts we have not used stone.

"From the employment point of view the Exhibition has an importance of its own. At the present moment we have over 2,500 men at work and before we finish the job the number may have to be doubled. Three quarters of them are ex-service men. And those are only the men directly employed. Very little imagination is required to realise the enormous numbers to whom the exhibition gives employment indirectly.

"I am often asked by the doubting Thomases if the exhibition will be ready in time for next April. On that subject I have no doubt whatever. So far as the builders are concerned the Exhibition will be completed. If that be a record so far as Exhibitions go so much the better.

"The past six weeks have seen an enormous advance, particularly in the overseas sections, and now hardly a day passes without visible progress being made.

"All the buildings with one or two insignificant exceptions are now well under way."

Materials Used

As indicating the size of the Exhibition Sir Robert gave some figures of the amount of material actually used up to the end of July which are worth reproducing:—

Sand and ballast	100,000 tons
Cement	16,000 tons
Ashes	45,000 tons
Reinforcing steel	2,500 tons
Structural steel	4,000 tons
Roofing	300,000 square feet
Roof glazing	250,000 square feet

In all, excluding the stadium, which has been completed for some months, something like a quarter of a million cubic yards of earth have been excavated for the foundations of the exhibition.

Sir Robert further says: "I think the exhibition has been well named 'the Shop Window of the Empire' as my experience in visiting many parts of the Empire has been that a much greater exchange of commodities would be done if greater knowledge existed to what each colony is capable of producing.

The plans of the amusement park show a development in catering for the lighter side of the people which will be a delight as well as a surprise to Britishers who have never before had such an opportunity of enjoyment on so large and varied a scale."

Road Materials and Plant

United Kingdom firms engaged in the manufacture of road building machinery are, as a whole, experiencing a steady flow of orders at the present time, owing to the large amount of new road construction which is being carried out in the United Kingdom.

New Books

Electrical Methods of Handling Materials

"The Electrical Handling of Materials" by H. H. Broughton, is a four-volume series of books, dealing with the design, construction and application of cranes, conveyors, hoists and elevators. The fourth volume has just been published, it dealing specifically with the machinery used for the mechanical handling of materials and the methods of handling and storing materials. The 323 large-size pages of text contain very detailed descriptions of machinery and methods which are further explained by photographs and drawings, of which a large number are included. The chapter headings, which give a good indication of the scope of the book, are as follows; Elevators and conveyors; belt conveyors; automatic feeders;

Practical Phases of Engineering

"Lectures on Engineering Practice" is a 90-page book, containing a series of three lectures delivered during 1922 and 1923 at the School of Engineering, John Hopkins University. The lectures, which deal with practical phases of engineering problems, are "The Relation of Highway Research to Modern Road Construction," by Mr. A. T. Goldbeck, chief, Division of Tests and Research, U. S. Bureau of Public Roads, Washington, D. C.; "Possibilities for Steam Railroad Electrification," by Mr. Norman Wilson Storer, general engineer, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., and "Power Development—Past and Future," by Mr. George A. Orrok, Consulting Engineer, New York City. The book is edited by John B. Whitehead, Dean of the Faculty of Engineering, John Hopkins University, and is published by the John Hopkins Press, Baltimore, Md. It sells at $1.00.

Trade Publications

Steam Shovel Upkeep Costs

An unusually interesting booklet that will prove exceptionally valuable to steam shovel owners and operators has been issued by the Erie Steam Shovel Company, Erie, Pa. It is an upkeep cost record book that aims to satisfy the request that has often been made that manufacturers of steam shovels furnish the user with actual figures on output and upkeep costs. This is the first time, it is believed, that any manufacturer has gathered together such data, classifying and tabulating the averages for convenient use, and offered it for free distribution. The booklet reviews and summarizes the upkeep cost and output records of 48 Erie shovels that have moved an average of more than 300,000 cu. yds. each. The data, which has been carefully checked, is classified according to the kind of excavation handled by the shovels. These performance records were obtained by the Erie Shovel Company as the result of a competition for which more than 500 entries were received.

Hints for the Contractor

A Handy Bridge Contractor's Derrick

The accompanying photograph shows a convenient semi-portable outfit for contractors on bridge and similar work, the outfit illustrated being operated by Mr. J. A. McKinnon, contractor of Paisley, Ont., in connection with the replacement of an old wooden bridge. The plant consists of a belt-driven hoist on skids driven by an 8 h.p. portable engine shown in the foreground. The derrick is of the stiff-leg type with boom swinger operated from the hoist, the raising and lowering of the boom being taken care of by a handy mast winch. This particular outfit is handling loads up to 2 tons with a 40 ft. boom, and is used on excavating and constructing bridge abutments in Bruce County, Ont., of which Mr. G. E. Stephenson is the engineer.

Hoist on skids belt driven from 8 h.p. engine operates derrick

The work is being carried out while keeping the old wood bridge in operation, as is shown in the background of the picture, so that the interruption of road traffic will be reduced to the minimum and will only occur when the actual replacing of the wood span with the steel is carried out.

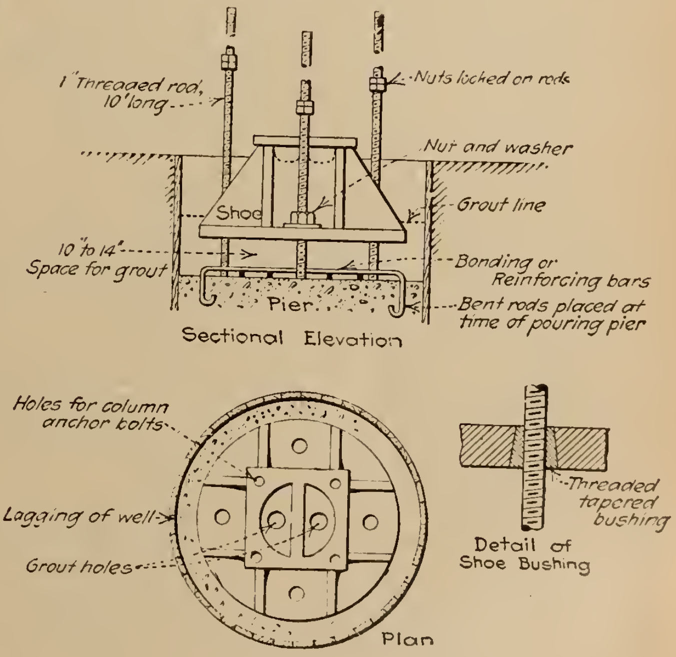
This derrick outfit is comparatively easily knocked down and transported from place to place. It was furnished by the Toronto office of Mussens Limited, the hoist and winch being the product of the Marsh Engineering Works, Belleville, Ont.

Derrick in use on bridge replacement job

New Method of Placing Column Shoes for Steel Frame Buildings

A convenient method of setting column shoes and grillage on the foundation piers of large buildings is being employed in the construction of the new Union Station at Chicago, according to Engineering News-Record. It permits of more rapid erection and insures stable support for shoe and column.

In common practice, after the head of the pier has been cleaned of laitance and foreign material, the shoe is placed on brick or concrete blocking on top of the pier and, after it is adjusted to level, grout is poured in through holes in the base to fill the 3- to 6-in. space between the shoe and the pier. This grout is usually required to be left for 70 to 90 hours before any load is placed on the shoe. When a girder is to be fitted against the web of the column, it is customary for the erector to push the column laterally so that the girder will clear the flanges. This movement of the column frequently results in a tipping of the shoe and crushing of the grout under its edges, especially as the grouting is often more or less incomplete or defective. Tilting of the shoe in this way may result in considerable expense and delay by making it necessary to remove the column, readjust the shoe and then start the steel-work again.


1" Threaded rod, 10' long
Nuts locked on rods
Nut and washer
Shoe
Grout line
10" to 14" Space for grout
Bonding or Reinforcing bars
Pier
Bent rods placed at time of pouring pier
Sectional Elevation
Holes for column anchor bolts
Lagging of well
Grout holes
Plan
Threaded tapered bushing
Detail of Shoe Bushing

Screw supports for column shoes

The new method of carrying the shoe consists of providing an adjustable support which will hold the shoe in place until the grouting has been completed, and which will take care of erection stresses until the grout has hardened sufficiently to take the required stress. Four taper holes are cored in the shoe base, and threaded taper bushings of soft steel are set in them, as shown by the sketch. Four 1-in. steel rods

10 ft. long, threaded for their entire length, are used for raising or lowering the shoe.

When the shoe is to be placed, the four rods are screwed into the threaded bushings, so as to project 12 or 14 in. below the base. A nut and washer on top of the base are screwed up when the shoe has been adjusted so as to prevent the shoe from tipping. Two square nuts are locked on the upper part of each rod, above the shoe. The shoe is brought to exact level by gripping each threaded bar with a wrench applied to the locked nuts, thus turning the bars like screw jacks until the shoe is raised or lowered to proper level. Wedges driven between the shoe and the wood lagging of the pier prevent lateral displacement of the shoe. Then 1:1 grout is pumped in to fill the space under the shoe. To bond this grout cap to the pier, two hook-end bars have their vertical ends set in the concrete at the time the pier is being completed.

When the grouting is completed, the projecting ends of the threaded rods are broken off above the nuts and washers with a cold chisel, and are used in another shoe.

The usual cost of setting one shoe by the old method ranges between $50 and $300, and sometimes reaches $400 with a large shoe or grillage lowered to a considerable depth in the casing or well above the top of the pier. With the rod method, the labor cost of setting a shoe averages about $12, and the total cost $22.

This new method of securing column shoes to concrete piers for support of steel structural work was invented by G. W. Allen, superintendent of construction for Graham, Anderson, Probst & White, of Chicago, who are the architects for the Union Station.

Effect of Accelerators on Concrete*

During the past two years a sub-committee of Committee C-9 has conducted a co-operative series of tests on accelerators of the calcium chloride type. For some reason, or perhaps several reasons, tests of accelerators do not always give as uniform results as other kinds of tests, and the general conclusions of the report should not be assumed to hold for every possible combination of accelerators and concrete materials. On the other hand, it seems safe to assume that an accelerator which adds to the concrete mixture 2 or 3 per cent (by weight of the cement) of calcium chloride will in the very great majority of cases markedly increase the rate of early hardening.

The tests show that 2 to 4 per cent additions to 1:2½ mortars increase 2-day strength from 40 to 70 per cent, 7 day from 15 to 32 per cent, 28 day from 1 to 18 per cent and 3 months and one year from 2 to 10 per cent.

The individual results show a very wide range and numerous inconsistencies. However, the averages of all the results seem to establish the general conclusion that the beneficial effects of the accelerators are confined to the early age under the prescribed laboratory conditions of curing and storage. Under these conditions the effect of the calcium chloride is to accelerate the hydration of the cement markedly during the first few days, but the resulting gain in strength largely disappears at the 28-day period and thereafter. The relative strengths of the mortars containing the accelerators after the 28-day period are slightly higher than those of the concretes and of the plain mortars for the later periods.

The marked differences in the results reported from the different laboratories indicate that different brands of cement respond in different degree to the accelerators but the inconsistencies in the results are sufficiently numerous to warn against drawing any positive conclusions in this respect. While the action of calcium chloride on cement is not well understood, it is to be presumed that it is effective in promoting the hydration of one or more of the main constituents of the cement, and as these constituents are known to exist in different proportions in different cements, and even in different lots of the same brand of cement, it should be anticipated that different brands or lots would respond in different degree to the action of accelerators.

In regard to the comparative effects of different accelerators, the data obtained in this investigation suggests that the acceleration of hardening is probably dependent either upon the proportion of calcium chloride to the cement, or the concentration of calcium chloride in the gaging liquid. A considerable amount of time was therefore given to an analysis of the complete data from three of the co-operating laboratories, in which the relative strengths were plotted against the two factors: ratio of anhydrous chloride to cement, and concentration of anhydrous chloride in the gaging water. Curves of the same type were obtained in both cases but the wide range of individual results made it impossible to determine to which of these two factors the relative strengths were more closely related. It would undoubtedly be of interest to know more than we do at the present time regarding the relation of quantity or strength of calcium chloride to the acceleration of the hardening of concrete, and in fact to know more about the action of calcium chloride on cement, but this information must come from a more comprehensive and carefully planned investigation. So far as the data from these tests can be interpreted, the different accelerators produce effects which are mainly dependent upon their calcium chloride content. It is not to be inferred, however, that the acceleration of hardening is directly proportional to quantity or concentration of calcium chloride, for a maximum effect upon the strength of concrete exists on the average not much beyond the maximum concentrations employed in these tests.

In conclusion, the sub-committee would recommend that if further data were to be sought on the effects of accelerators, perhaps the information of greatest practical value would be forthcoming from their effects upon mortar or concrete at temperatures in the neighborhood of the freezing point, and also under conditions where wet curing is impracticable. Results indicate that calcium chloride is more effective under dry curing than under moist curing. It is important also that definite knowledge be obtained regarding the effect of accelerators upon the steel in reinforced concrete. Such meager information as is available at the present time indicates that when steel is completely embedded in dense concrete, the danger of serious corrosion from the chloride is negligible, but it is doubtful whether this statement applies to all types of reinforced-concrete construction under all conditions of exposure.

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*An abstract of the report of a committee of the American Society for Testing Materials.

For the Building Supply Dealer

Do You Use Your Trucks as an Advertising Medium?

A Splendid Opportunity to Advertise Your Name and Products—How to Put the Idea Across

It is not usually possible for the building supply dealer to equip his trucks with novelty body designs as is being done so successfully in other retail lines to advertise the business. Most building supply trucks must be designed for rapid handling of loads and this type does not always lend itself to unusual or "odd" effects except perhaps at a sacrifice of the truck's ability. Experience has shown that it is best for the building supply dealer to avoid experimenting with novelty body designs.

But recent tendencies in various lines of business, to make trucks advertise their owners, have been so noticeable and generally successful, that it is well to strongly emphasize that here is an opportunity the building supply dealer cannot afford to neglect. What can he do to take full advantage of the advertising possibilities of his truck fleet? How can he make his trucks so striking in appearance that they will attract attention as they appear on the street or so subtly attractive that they will create a favorable impression toward the concern whose name appears on them?

Letter Combination Is Most Prevalent Opportunity

By far the most desirable oportunity offered to the dealer in cashing in on the advertising value of his delivery equipment is that of distinctive and attractive lettering upon the vehicle's body. Some concerns prefer to use novelty effects with colors that "clash" in order to attract attention. Some even go so far as to create a "freak" combination of colors which will create a distinctive originality for the company. For the most part, however, such attempts have been more nearly confined to fancy arrangements of color, with possibly an illustration to impress some particular selling point in conjunction with the concern's other advertising. On the other hand, another school of opinion favors extreme conservatism in the use of simple, dignified and characteristic lettering which serves alone to build a character and prestige for the company. Those who have adhered to this policy are usually emphatic in believing that all thru their advertising they should provide that simple touch of refinement and conservatism that will go far to create good-will of a favorable sort in the public mind.

Trucks Must Work for Attention

Yet, no matter how the individual dealer may look upon the characteristics of such advertising, there are a few suggestions that may be offered and that will prove interesting to review. They may be briefly stated, as follows:

1. As in all other advertising, in order to create interest, the subject must work hard for attention. Therefore, it is extremely advisable to get away from the commonplace, either in one direction or another. It is usually not enough to merely say that "we will put the firm name, address and telephone number on the body along with a few words to describe our service, and leave the arrangement and color scheme up to the painter." Careful thought should be given to the phrasing and arrangement in each case, in order to provide the most desirable advertising appeal and in order to best reflect the character of the business. Once having found a good arrangement, it should be used for all trucks in the fleet. Even greater attention should be given to this than to other phases of advertising.

Trade Mark or Slogan Gets Across "Selling Talk"

2. There is much to be said in favor of the adoption of a distinctive "trade mark" or slogan, or both, and the prominent display of this upon the delivery vehicle. By the association of ideas, expressed in an appropriate illustrative trade mark or a few well chosen words, it is always conceded that the most effective "selling talk" can be put across in the public mind. There is an unusual opportunity for a wide and constant display of such a trade mark or slogan by reproducing it prominently upon the truck body.

Displaying the Phone Number—Good Painting a Requisite

3. The dealer's telephone number, when it is fortunately easy to remember, deserves a prominent place upon the body design. Many concerns have expressed the opinion that they obtain a substantial amount of business by giving good display to the telephone number so that it will be easily recalled or easily recognized.

4. Good painting and lettering is always justifiable and this fact is borne out by the experience of those who have always insisted upon it. A cheap job will invariably look cheap and will reflect an unfavorable impression.

Neat Appearance a Vital Point

5. Experience has shown that a definite system should be adhered to in keeping up the vehicle's appearance. By careful attention to the following elements, the concern will not only keep its trucks in attractive appearance, but it will be assured of obtaining a maximum of economy in doing this:

(a) Insistence upon good painting and lettering in the first place; (b) Frequent, complete washing and polishing; (c) Revarnishing just as soon as the original paint shows the slightest signs of losing its original attractiveness; (d) Complete repainting at intervals of from 15,000 to 25,000 miles, according to severity of service and method of care. The old paint should be entirely removed. This not only gives a better appearance than "painting over," but it will endure a much longer period of service.

Featuring Service Facilities

The building supply dealer's opportunity for getting the most advertising advantages from his truck equipment do not end with the neatness and attractiveness of their appearance on the street. Many concerns have found it very desirable to prominently feature the good service afforded by their modern fleet of trucks, in various other forms of advertising, such as newspaper, direct mail advertising and blotters. It is quite easily possible to build up an excellent sales argument for reliable and prompt service by featuring the trucking facilities as a part of any advertising effort that may be made. Some concerns have taken pictures of their trucks and have shown these pictures along with an appropriate caption line in the various forms of their advertising. The thought behind such an idea, of course, is that "we are equipped to render prompt and reliable service." Obviously, such an idea has worth-while opportunities for building up an individual personality for the truck fleet and at the same time impressing an excellent sales argument.—By P. L. Sniffin in "Building Supply News."

Building Supply Situation in Toronto

As far as the building supplies situation in Toronto is concerned, representative dealers claim that the present situation is satisfactory. While at the present moment a slight slackness is noticeable, sales up till now have been holding up to an anticipated volume with the result that, without exception, the dealers will be able to report a prosperous and profitable year. For the future, the dealers in Toronto vicinity do not anticipate any great lull. While house building is falling off there is sufficient business on their books and in prospect to warrant the belief that the next few months will be entirely satisfactory.

Prices of building supplies have been holding firm all season. Dealers, as a whole, do not see any cause for price reduction in the near future, inasmuch as labor is still as high as ever—and in the manufacture of most building supplies labor is by far the predominant factor. Production of all building commodities has been very satisfactory. At no time has any shortage been experienced. In fact, as one dealer pointed out, there has been a tendency to over produce the rougher supplies such as stone and sand. Probably under the stimulus of active road building throughout Ontario, quarries and sand pits have been spurred to full production with the result that at the present time there seems to be an oversupply of these materials. This dealer pointed out that this may have a tendency to throw this surplus on the market with resulting price rearrangements.

New Supply Firm in Thorold, Ont.

The McCleary Lumber and Coal Co., Ltd., of Thorold, Ont., were recently incorporated to handle lumber, millwork, fuel and building materials. They also have the agency for the Niagara district for the Sterling Roofing and Paint Products Co. The president of the company, A. E. Kaiser, was for many years office manager of McCleary and McLean, lumber manufacturers, Thorold, Ont. At present he is located in Park Falls, Wis., where he has extensive lumber interests. Mr. F. W. Moore is vice-president. He is identified in the same capacity with the Exolon Co., of Thorold and Blaisdale, N. Y. The secretary-treasurer is L. B. E. McCleary who was formerly with McCleary and McLean and also at one time engaged in the manufacture of lumber in Minnesota. He will have charge of the McCleary Lumber and Coal Co.'s business at Thorold.

Bright Prospects on the Coast

New Westminster, B. C.
September 1, 1923.

Editor, Contract Record:

The building operations in New Westminster and District at the present time are normal, being mostly residences and stores, with prospects for the balance of the year very much brighter.

The demand for materials is fair with the supply in good shape for the present and a reasonable increase. Prices are firm and have changed very little during the whole season.

Yours very truly,
Gilley Bros. Ltd.
per E. Roland Gilley.

Hemmings Falls Power Development

The contract for the construction work in connection with the development of one of the Southern Canada Power Company's power sites, located at Hemmings Falls, near Drummondville, Que., on the St. Francis River, was recently let to The Foundation Co. Limited of Canada.

The design and construction of the Hemmings Falls Development is in charge of Mr. J. S. H. Wurtele, plant manager of Southern Canada Power Company. The purchase of building materials will be looked after by the contractors, while the purchase of machinery and equipment will be made through the purchasing department of Southern Canada Power Company.

At Hemmings Falls it is proposed to develop 30,000 horse power. This will be the second in a chain of six power developments of Southern Canada Power Company, on the St. Francis River, having an estimated aggregate capacity of 150,000 horse power. Over half of the capacity of the Hemmings Falls plant has already been sold, and it is not beyond expectation that the total capacity of the plant will be disposed of by the time the plant is in operation, if the territory served by the company grows industrially at the rate it has in the past few months. It is proposed to develop the other sites as fast as the demand for power warrants it.

New Road-Breaking Apparatus

A road-breaking apparatus of a new type has been designed by Merryweather & Sons, Ltd., Greenwich, London. This consists of a light water-tube boiler supplying steam to a jack-hammer percussion tool which delivers blows at the rate of 1,600 per minute. The boiler is easily portable, and constructed so that should the water supply become insufficient the tube joints fail and allow the water to quench the fire,

How Should Concrete Floors be Built?

Proper Construction Must be Used if Floors are to Wear Well and Give Good Service—A. C. I. Specifications are Recognized as Standard

What architect or engineer would permit important work to be done without specifications? None, surely, because designers realize that specifications correctly written in accordance with recognized principles constitute half their battle for a well-built, satisfactory structure.

And the more important the work the greater the need for specifications to control its every detail. Take concrete floors, for instance: no part of any building is subjected to greater wear, tear and abuse. To permit them to be built without the best specifications obtainable would lead to uncertain and often unsatisfactory, if not disastrous results.

But good concrete floors for any purpose can be obtained with certainty if the specifications of the American Concrete Institute are observed. These specifications, which follow, were presented at the last annual meeting of the Institute and there adopted as a tentative standard.

I. Application and Use

A. FOREWORD

These "Standard Specifications for Concrete Floors" of the American Concrete Institute, with supplementary notes† explaining and amplifying the specifications were prepared by the Committee on Concrete Floor Finish.

B. APPLICATION OF SPECIFICATIONS

These specifications apply to floors in buildings, whether subjected to moderate or heavy traffic, and cover the laying and finishing of the floor; also its protection during early hardening.

C. USE OF SPECIFICATIONS

For architects, engineers and others desiring to embody these specifications in their general specifications covering a particular piece of work, the following outline of the paragraphs necessary to meet the different conditions will prove convenient:

Floors Laid on Ground: Moderate or Light Traffic.

Two-Course—Paragraphs 1-19 (except 8); 34-52; 54-57.

One-Course—Paragraphs 1-19 (except 8); 34-47; 58-62.

Floors Laid on Ground: Heavy Traffic.

Two-Course—Paragraphs 1-19; 34-51; 53-57.

Reinforced Concrete Floors: Moderate or Light Traffic.

Paragraphs 1-26 (except 8); 28-33.

Reinforced Concrete Floors: Heavy Traffic.

Paragraphs 1-25; 27-33.

II. Materials

A. PORTLAND CEMENT

1. Portland cement shall meet the requirements of the current Standard Specifications for Portland Cement adopted by the American Society for Testing Materials.

B. AGGREGATES

General Requirements

2. Before delivery on the job, the contractor shall submit to the architect or engineer a fifty (50) lb. sample of each of the aggregates proposed for use. These samples shall be tested, and if found to pass the requirements of the specifications, similar material shall be considered as acceptable for the work. In no case shall aggregate containing frost or lumps of frozen material be used.

Crusher run stone, bank run gravel or mixtures of fine and coarse aggregate prepared before delivery on the work shall not be used.

Many kinds of stone, from very hard quartzite to soft limestone, are crushed to the required sizes and used as concrete aggregates. Similarly, many varieties of pebbles are used. The natural tendency is to use materials at hand; but if aggregates are not of good quality or if they contain too much clay or other impurities, a poor concrete will result. Hence it is highly important that the aggregates be tested unless their quality is known.

The use of frozen aggregates results in very inferior concrete. Lumps of ice and frozen gravel go through the mixer and into the forms without being combined with the cement When they thaw out, voids or stone pockets are left in the concrete.

Mixed Aggregate

Sand and pebbles from a pit, or crushed stone from a crusher are seldom if ever properly graded for use in concrete. There is nearly always a surplus of fine material from a pit and of coarse material from a crusher. That is, if one hundred (100) cubic feet of material from a gravel pit is passed over a one-fourth (¼) inch screen, perhaps seventy (70) cubic feet will pass through and forty (40) cubic feet will be retained on the screen. If a proper graduation is obtained by the use of two (2) cubic feet of fine with four (4) cubic feet of coarse material, only 20 cubic feet of the fine material should be used with the forty (40) cubic feet of pebbles retained on the screen. If the bank-run material were used, the resulting proportion would be seven (7) to four (4) instead of two (2) to four (4). This is the fundamental objection to the use of bank-run material, and a similar objection applies to crusher run material.

Prepared aggregate mixtures, which are sometimes supplied in carload lots, develop the same objections because coarse and fine materials become somewhat separated in transit so that no two individual wagon loads taken from the car will have the same relative proportions of fine and coarse aggregate. It is far better to handle the fine and coarse materials separately and combine them in proper amounts at the mixer.

C. FINE AGGREGATE

General Requirements

3. Fine aggregate shall consist of natural sand or screenings from hard, tough, crushed rock or gravel consisting of quartz grains or other hard material, clean and free from any surface film or coating and graded from fine to coarse, with the coarse particles predominating.

Grading

4. Fine aggregate, when dry, shall pass a screen having four (4) meshes to the linear inch; not more than twenty-five (25) per cent. shall pass a sieve having fifty (50) meshes per linear inch and not more than five (5) per cent. shall pass a sieve having one hundred (100) meshes per linear inch.

Aggregates are usually considered as belonging to one of two classes: fine aggegate, composed of sand or stone screenings, and coarse aggregate, composed of crushed stone or pebbles, the line of division, purely an arbitrary one, being marked by the screen having ¼-inch meshes. This division provides a simple and customary means of properly proportioning the aggregate as a whole.

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†Paragraphs in small type.

Impurities

5. Fine aggregate shall not contain injurious vegetable or other organic matter as determined by the colorimetric test nor more than five (5) per cent. by volume of clay or loam. Field tests may be made by the architect or engineer on fine aggregate as delivered at any time during the progress of the work. If there is more than one (1) hour's settlement after shaking in one hundred (100) per cent. excess of water, the material represented by the sample shall be rejected.

Unwashed materials may contain clay or organic impurities, comparatively small amounts of which may have ruinous effects on concrete. More than seven (7) per cent. of clay by volume may cause a serious loss of strength of the concrete, while even smaller amounts if present as a surface film on the particles, reduce the strength of concrete by preventing proper bonding with the cement. A recent series of tests at the Structural Materials Research Laboratory showed that the presence of organic matter to the extent of only 1/1000 pat of the weight of the fine aggegate may decrease the strength of the resulting concrete by twenty-five (25) per cent. The field test for clay or loam and the colorimetric test for organic matter are simple methods for determining the presence of such impurities.

The colorimetric test may be applied in the field as follows: fill a twelve (12) ounce graduated prescription bottle to the four and one-half (4½) ounce mark with the sand to be tested. Add a three (3) per cent. solution of sodium hydroxide until the volume of sand and solution, after shaking, amounts to seven (7) ounces. Shake thoroughly and let stand for twenty-four (24) hours. The sample shall then show a practically colorless solution, or at most a solution not darker than straw color.

Mortar Strength Test

6. Fine aggregate shall be of such quality that mortar composed of one (1) part portland cement and three (3) parts fine aggregate, by weight, when made into briquets, shall show a tensile strength at seven (7) and twenty-eight (28) days at least equal to the strength of briquets composed of one (1) part of the same cement and three (3) parts standard Ottawa sand, by weight. The percentage of water used in making the briquets of cement and fine aggregate shall be such as to produce a mortar of the same consistency as that of the Ottawa sand briquets of standard consistency. In other respects all briquets shall be made in accordance with the methods of testing recommended by the American Society for Testing Materials. (See Standard Specifications and Tests for Portland Cement of the A. S. T. M. Serial Designation C 9-21.)

D. COARSE AGGREGATE

Coarse Aggregate

7. Coarse aggregate shall consist of clean, hard, tough, crushed rock or pebbles graded in size, free from vegetable or other organic matter, and shall contain no soft, flat or elongated particles. The size of the coarse aggregate shall range from one and one-half (1½) inches down, not more than five (5) per cent. passing a screen having four (4) meshes per linear inch, and no intermediate sizes shall be removed.

No. 1 Aggregate

8. No. 1 aggregate for the wearing course shall consist of clean, hard, tough, crushed rock or pebbles, free from vegetable or other organic matter, and shall contain no soft, flat or elongated particles. It shall pass when dry a screen having three-eighths (⅜) inch openings and not more than ten (10) per cent. shall pass a screen having four (4) meshes per linear inch.

The hardness of the aggregate is a feature to be considered, but it is of lesser important in influencing the strength or resistance to abrasion of concrete, than the methods of mixing and placing and of protecting the floor during the early hardening period. However, where great resistance to abrasion is essential, as in the construction of floors that will be subjected to heavy trucking, the hardness of the aggregate (particularly for the wearing course, if there is one) becomes most important, and in such cases the use of small pebbles or small pieces of hard crushed rock (No. 1 aggregate for wearing course) is desirable. If used in the proportions given in paragraph 27, such aggregate will help to produce a harder and more wear-resistant surface.

To secure good concrete the coarse aggregate should have a maximum size of approximately two (2) inches for plain concrete and 1 inch for reinforced work. Slabs less than four (4) inches thick and heavily reinforced may require ¾ inch as a maximum. A well graded coarse aggregate generally produces a denser and stronger concrete than an aggregate of uniform size.

E. WATER

9. Water shall be clean, free from oil, acid, alkali or vegetable matter.

A safe rule for mixing concrete is to use only water which is fit to drink.

F. COLOR

General Requirements

10. If artificial coloring matter is required, only those mineral colors shall be used which, in the amount hereinafter specified, will not appreciably impair the strength of the cement.

Mineral coloring material is preferred to organic coloring material, because the latter fades more than mineral colors, and because it may seriously reduce the strength of the concrete. Mineral coloring may reduce the strength of concrete somewhat, but where the quantities used are less than 5 per cent., this is not serious. The use of colored aggregates is preferable in obtaining color effects, the surface of the floor being brushed or ground to expose the aggregate.

G. REINFORCEMENT

General Requirements

11. The reinforcing metal shall meet the requirements of the current Standard Specifications of Steel Reinforcement of the American Society for Testing Materials. It shall be free from excessive rust, scale, paint or coatings of any character which will tend to reduce or destroy the bond.

H. JOINT FILLER

12. The joint filler shall be a suitable compound that will not become soft and run out in hot weather, nor hard and brittle and chip out in cold weather; or, prepared strips of fiber matrix and bitumen as approved by the architect or engineer. The strips shall be one-half (½) inch in thickness and their width shall at least equal the full thickness of the slab

III. Construction

A. PROPORTIONING

Method of Measuring

13. The method of measuring the materials for the concrete or mortar, including water, shall be one which will insure separate and uniform proportions of each of the materials at all times. A sack of portland cement (94 lb. net) shall be considered as one (1) cu. ft.

Uniform proportioning, and uniform consistency of concrete are essential for high grade floor construction. If wheelbarrows are used to measure the aggregates, a simple method should be provided to check occasionally the amounts in the barrows. Boxes made to set in the barrows and holding one or more cubic feet are useful. Some barrows are built with level tops so that they may be struck off to known capacity. A small tank capable of delivering a fixed volume of water for each batch insures a more nearly uniform consistency than can be obtained when water is added by means of a pail. Batch mixers are now generally equipped with water measuring devices.

B. MIXING

Machine Mixing

14. All concrete shall be mixed by machine except when the architect or engineer shall otherwise permit under special conditions. A batch mixer of an approved type shall be used. The ingredients of the concrete or mortar shall be mixed to the specified consistency, and the mixing shall continue for at least one (1) minute after all materials are in the drum. Raw materials shall not be permitted to enter drum until all the material of the preceding batch has been discharged.

Concrete must be thoroughly mixed before it is deposited in the forms. Experiments have shown that the strength of concrete increases rapidly with the time of mixing up to one minute. The rate at which the mixer revolves, i e., between 12 and 25 R. P. M., has little influence on the strength of concrete. A small mixer should not be speeded up where it is necessary to place a large volume of concrete in a short time, because insufficient mixing decreases the strength of concrete. If a given mixer cannot mix enough concrete thoroughly in the available time, a second mixer or a larger one should be provided. Continuous mixers do not produce as uniform concrete as do batch mixers and are therefore not recommended.

Hand Mixing

15. When it is necessary to mix by hand, the materials shall be mixed dry on a watertight platform, until the mixture is of uniform color, the required amount of water added, and the mixing continued until the mass is of uniform consistency and homogeneous.

Where large volumes of concrete are to be placed, hand mixing will generally be found more expensive than machine, but good results may be obtained with hand mixing if the specifications are carefully followed.

Retempering

16. Retempering of mortar or concrete which has partially hardened, that is, mixing with or without additional materials or water, shall not be permitted.

Concrete or mortar should be deposited in place as soon as possible after mixing; otherwise it becomes partially hardened. If that happens it should be thrown out because it will not attain its full strength even if remixed with other materials.

The hardening of concrete is a process which requires time and the presence of moisture. The more thorough the process the harder and stronger the concrete. As mentioned hereafter, it is important that a minimum amount of water be used in mixing the concrete, but after the concrete is deposited in place, it is even more important that its water content be retained and not allowed to drain off or evaporate. Drenching the subbase with water before depositing the concrete reduces the loss of water from below by gravity or capillary action, but that alone is not sufficient: evaporation from above must also be prevented. A common method of protecting the concrete so as to retain its water content is to cover the surface with damp earth or sawdust as soon as it has hardened sufficiently to prevent injury thereby, and then to keep the sand damp by frequent sprinkling. Where feasible, an excellent method is to build small dams of clay or other suitable material around the floor, and then flood it with a few inches of water. In other cases a covering of wet burlap has been found satisfactory. This protection should be continued for at least ten days, and if possible for three weeks. Laboratory tests have shown that protecting the surface of a concrete floor in this manner for the first ten days will increase the compressive strength and resistance to wear fifty (50) per cent. "Proceedings," American Concrete Institute, 1921, p. 251. In other words, this one item of ten (10) days' protection will give the owner of a concrete floor fifty (50) per cent. greater value for his money. Still better results will be obtained if this protection can be continued for three weeks, or longer if practicable.

C. CURING

Covering

17. As soon as the finished floor has hardened sufficiently to prevent damage thereby, the floor shall be covered with at least one (1) inch of wet sand, or two (2) inches of sawdust, which shall be kept wet by syrinkling with water for at least ten (10) days.

Protection

18. The freshly finished floor shall be protected from hot sun and drying winds until it can be sprinkled and covered as above specified. The concrete surface must not be damaged or pitted by raindrops, and the contractor shall provide and use when necessary sufficient tarpaulins to completely cover all sections that have been placed within the preceding twelve (12) hours.

D. TEMPERATURES BELOW 40° F.

Temperature below 40 Degrees Fahrenheit

19. If at any time during the progress of the work the temperature is, or in the opinion of the architect or engineer will, within twenty-four (24) hours, drop to 40 degrees Fahrenheit, the water and aggregate shall be heated and precautions taken to protect the work from freezing for at least five (5) days.

If concrete is allowed to freeze during the early hardening period, it may be seriously damaged and its hardening will be greatly delayed. Warmth as well as moisture is necessary for the proper hardening of concrete, so that the concrete should have a temperature of at least 60 deg. F. when deposited and provision made to maintain this temperature for at least five days.

What the American Construction Council is Doing

At the last meeing of the Executive Committee of the American Construction Council, President D. Roosevelt, through the Committee, announced the creation of additional executive positions to expedite the administration of the expanding activities of the Council. Mr. D. Knickerbacker Boyd, President ot the Philadelphia Building Congress, was named Executive Vice-President of the Council and at the same time Dwight L. Hoopingarner, formerly Executive Manager of the Cleveland Building Trades Employers' Association, was appointed the Council's Executive Secretary. Joseph H. Alexander, Vice-President of the Cleveland Railway Company and John E. Lloyd, President of the Wm. M. Lloyd Company of Philadelphia, have accepted vice-presidencies in the Council.

The efforts of the Council are being intensively directed first on several of the most urgent problems confronting the construction industry, such as promotion of and co-operation with local building congresses, a national survey of apprenticeship needs and conditions of labor supply, promotion of the stability of employment and reduction of unemployment, comprehensive steps toward the determination of the causes and the elimination of waste in all its phases throughout the industry, a general educational program as to the problems of the industry and its development, and the promotion of the construction activities as a great American industry.

Road Problems that Require Solution

Research Suggestions That Are Pressing for Early Investigation

By W. K. HATT,
Director, Advisory Board on Highway Research

In order to determine what each can do to expedite the collection of authentic data on the basis of which highways may be wisely selected to meet the economic needs of the region, properly built to conform to the economics of the situation, and operated in the interest of the public, the immediate necessities may be outlined:

(1) Many problems in highway engineering are accompanied by corollary problems in economics of highway transport. For instance: What sum may profitably be spent in capital costs of construction to reduce a grade? The answer must depend on volume of traffic and on operating costs of road and vehicle. Again, decisions upon changing second-class into paved roads involve cost of road maintenance, tires, gasoline, and repairs and depreciation to vehicle, etc. The reduction of operating costs due to improved surfaces are large on roads of heavy traffic; how heavy? The reflex action of improved alignment on change of design of vehicle also suggests itself. Reliable data appear to be largely wanting. Research activities should be pushed.

Financial Aspects of Road Construction

(2) The study of methods of financing road construction, and the distribution of the expense between those benefited, awaits fact-finding surveys. The study itself needs the services of trained economists. The sources from which the tax dollar comes, and its distribution among roads, education, charities, etc., should probably be determined.

(3) Studies of the effect of highway improvements on land values are needed; and also of the effect of highway improvements upon industry and the development of typical regions, such as truck farming or resort areas. The results of such studies will be a guide for similar areas under development.

(4) The laws governing the growth and dispersion of traffic, and the mechanics and psychology of safely handling such traffic in congested areas, need study by research methods.

(5) The purpose and methods of, and the instrumental equipment for, basic traffic surveys upon which construction and maintenance funds may be allocated is a live issue.

(6) The large volume data, accumulated at the cost of hundreds of thousands of dollars, through studies of soil properties, effects of loads and strength of slab—data that underlie the as yet undiscovered principles of the mechanics of slab design, should be brought together and analyzed to uncover the principles of action. The instrumental equipment and technique in this field represent a remarkable advance in the science of measurement. With the mechanical principles determined, then the engineer can be given formulas for fitting the road to the load. If these principles are still hidden, final co-ordinated researches should be planned to settle these questions. If it is true, as it seems to be, that stiff slabs on soft sub-grades should be thick at the edges and thinner at the centre, what should be the proper distribution of the thickness, and how should slabs be reinforced to provide longitudinal stiffness?

(7) The economics of pavement types in specified situations must be learned from carefully gathered data, so that decisions may be made less upon ex-parte arguments and more upon exact information.

(8) The findings of laboratory tests upon materials of construction should be scrutinized in the light of experience in operation to determine to what extent these tests are predictive of service value in the road. Studies of the destructive action of alkali and sea water upon concrete structures are of interest to highway engineers.

Fire Prevention Week, Oct. 7th-13th

Comprehensive plans are being formulated for observing October 7th to the 13th as Fire Prevention Week. In a number of cities and towns, efforts are already under way to co-ordinate the activities of all local interests by appointing a general campaign committee representing the various organizations in the community. This year, the main emphasis is to be placed upon (1) Better fire prevention in public institutions; (2) Fire prevention instruction in schools and colleges; (3) More thorough inspection of buildings by fire departments and extensions of systems which may at present be in force; (4) Correction of deficiencies in building and fire prevention ordinances. As in former years, a proclamation will be issued and a limited quantity of campaign literature will be prepared for general distribution through local channels.

Hot Water Heating Not Dangerous

Hot water systems, in so far as the pipes are concerned, are practically non-hazardous. The pipe temperature is ordinarily very low. On the other hand, steam pipes are admittedly the cause of occasional fires where the pipes have been in contact with inflammable materials. In the course of years, wood in contact with steam pipes carbonizes and under certain conditions may ignite spontaneously. A number of fires, during the past few years, have been charged to this cause.

Letters to the Editor

Low Bidder Should Get Contract

Hamilton, Ont.

Editor, Contract Record:

I have read the article in your issue of August 22, entitled "Political Juggling of Municipal Contracts." My own opinion in this matter is that municipalities, corporations or public bodies have no right whatever to invite any man to tender on work that they are not prepared to award to him if he is the lowest bidder.

A lot can be said in favor of giving local work to local contractors, and with this principle I do not think anyone will quarrel, but where that is the intention, then outside tenders should not be invited.

Your very truly,
Pigott-Healy Construction Co.
Per Jos. M. Pigott.

Regulations Affecting Design of School Buildings

A further portion of the "Recommended Building Code" of the Portland Cement Association follows. This part deals particularly with school buildings, libraries and museums.

Section 76. Classification

This classification includes all public, parochial, and private schools, colleges, academies, seminaries, libraries, museums and art galleries; including all buildings or parts of buildings used for the purpose of acquiring knowledge.

Section 77. Height and Class of Construction

Maximum Height. No building which accommodates primary or grammar grades, or pupils averaging 14 years old or less, shall be more than three storeys high, nor shall the topmost floor level be more than 35 feet above the grade at any outside door.

No building which is used as a high school, or which accommodates pupils averaging 18 years old or less, shall be more than four storeys, high, nor shall the topmost floor level be more than 48 feet above the grade at any outside door.

Class of Construction. Every building which is more than one storey high shall be of fireproof construction.

Buildings not more than one storey high may be of ordinary, mill, or fireproof construction.

First Floor Fireproof. In all one-story buildings the floor shall be of fireproof construction, except that floor panels and non-bearing partitions may be of protected construction.

Subdivisions and Fire Stops. Every building of this classification which is built in connection with a building of a lower grade of construction, shall be separated from such other buildings by standard fire walls, and all communicating openings shall be protected by standard fire doors. If such openings are used as a means of egress, they shall be kept normally open during the occupancy of the building.

In primary and grammar schools, the girls' and boys' portions of the basement shall be separated by a fireproof partition in which there shall be no opening except a door for the use of the janitor, kept normally closed.

Note. This serves the double purpose of fire protection and privacy.

Section 78. Exposure and Courts

No wall containing windows which light a school or classroom shall be less than 30 feet away from any opposite building, structure or lot line, or opposite court wall; except that the distance from such opposite court wall may be reduced to not less than 20 feet provided light rays at an angle of 45 degrees are not thereby obstructed from entering the entire upper half of any such window.

Section 79. Exits

Number, Location, and Type. The number and location of exits shall be such that, in case any exit or passageway is blocked at any point, some other exit will still be accessible, through public passageways, from every classroom, and from every other room used by the public or by the occupants generally.

Note. According to this requirement, every school building, however small, must have at least two exits. Furthermore, there must be an exit at the end of every corridor. Every stairway must lead to a separate exit door. But this section does not require more than one door to a classroom which accommodates not more than 100 persons.

Exception. In a high school, college, library, or museum building one or two classrooms may be placed between the exit and the end of the corridor.

In a one-room building only one exit will be required. In a one-storey, two-room building only one exit will be required, provided all basement partitions are of incombustible material and the boiler room door is a standard fire door.

At least one-half of the required exits, in buildings of more than one storey, shall be stairways. The remaining exits shall be either stairways, or horizontal exits; or fire escapes may be used as exits from floors which are not more than 40 feet above grade. All fire escapes on buildings which accommodate more than 100 persons above the first floor shall be "B" fire escapes.

In every building which accommodates more than 120 persons above the first floor, there shall be at least two stairways. In buildings of more than two storeys, the stairways shall be enclosed as in Section 20.

Note. In the case of stairways used by primary grades, the rise should be not more than 7 inches.

Closets shall not be placed below non-fireproof stairways.

Handrails shall be provided on both sides of all exit stairs used by pupils.

Basement stairways which lead to the first floor shall be separated by standard fireproof partitions from all parts of the basement which are used for general storage or for the storage of inflammable material. At least one basement exit shall open directly to the outside.

Total Width. The total width of exits from any floor shall be not less than the following rates, based on the total number of persons accommodated on such floor and on the floors above:

Non-fireproof building, 40 inches per 100 persons.

Fireproof buildings, 30 inches per 100 persons. If the stairways are enclosed and an approved automatic sprinkler system is provided in the basement, such width may be reduced as in Section 49.

Standard fire escapes may be used for not to exceed one-third of the above total widths, subject to the limitations given in this section under the heading "Number, Location and Type."

The capacity of a school building shall be established by the actual number of seats in rooms where such are used, or by the number of persons accommodated. The capacity of a library, museum, or art gallery shall be established by allowing to each person 100 square feet of the total floor area of the building, excluding stairways and elevators.

Exit Doors. Exit doors shall be as required in Section 23, except that they shall be not less than 2 feet 8 inches wide is used by children under 14 years. The aggregate width of exit doors shall be as required in this section under the heading "Total Width." No single door or leaf of a double door shall be more than 4 feet wide. No revolving door shall be considered as a required exit from a building used by persons under 18 years of age.

Note. Single doors are better than double doors for school buildings.

Passageways. Corridors and passageways shall be so designed as to prevent congestion and confusion and shall be provided with windows and artificial light so as to be kept well lighted while the building is occupied.

(To be continued)

Mainly Constructional

East and West—From Coast to Coast

Upon the recommendation of Works Commissioner R. C. Harris, the tender of the Russell Construction Co., Ltd., was accepted recently by the Board of Control at Toronto, for a new bridge over Avoca Vale, on St. Clair avenue east. The amount tendered was $572,464.76. The highest tender was $184,000 above this figure. The by-law covering construction of the bridge provides for an expenditure of $712,000, which is to include permanent paving on the bridge and approaches, adjustment of grades, acquisition of land, etc.

The Toronto office of T. McAvity & Sons, Ltd., has been moved from 95 King St. E. to 50 Lombard St. Mr. C. D. Allen is manager of the Toronto office.

The general contract for the erection of the Memorial Hall at the University of New Brunswick, Fredericton, N. B., has been let to B. Mooney & Sons, St. John, N. B. The total cost of this structure will be in the neighborhood of $120,000.

Up to the end of August this year a total of 80 highway projects in six of the Provinces of the Dominion, totalling over 785 miles, and involving a total expenditure by the Provinces concerned of $9,336,373, had been accepted by the Canada Highways Commission.. Ontario had 14 projects, totalling 100 miles accepted; Quebec, 6, totalling 110 miles; Prince Edward Island, 19, for 166 miles; Nova Scotia, 29, for 278 miles; Saskatchewan, 1, for about 3 miles, and British Columbia, 11 projects for a total of 130 miles. Acceptance by the Canada Highways Commission means that each project has been carefully inspected by a Federal inspecting engineer and has been found to conform to the plans and specifications attached to the arrangements entered into between the various Provincial Governments and the Federal Government.

A large terminal warehouse costing betwen $800,000 and $1,000,000 is to be erected on the water front at Toronto, immediately west of the new dock to be built for the Canada Steamship Lines. At its last meeting the Board of Harbor Commissioners approved of a lease of four and a half acres to a financier from Detroit. The plans of the promoter are to form a company locally to take care of the financing.

A campaign will be started among the members of the Parkdale Canoe Club, Toronto, to secure the sum of $60,000 needed for the construction of a new club house to replace the building destroyed by fire this year. This sum, together with the $100,000 recovered from insurance on the building, will cover the cost of the new structure.

Castona Products, Ltd., of Montreal, manufacturers of artificial stone products, have assigned to Alex. Desmarteau.

The city treasurer of Hamilton, Ont., has been instructed to dispose of $1,000,000 worth of civic debentures to provide for the following work: $700,000 for the new collegiate institute; $150,000 for improvements to various public schools throughout the city, and $150,000 for improvements to the General Hospital and other minor civic undertakings.

Automobile and other motor vehicles registered throughout the Dominion in 1922 numbered 514,657, an increase of 10.9 per cent. over the previous year. A circular issued by the Highways Branch of the Department of Railways and Canals also shows that revenues from registrations and license fees aggregated $9,279,243 in 1922, an increase of 21 per cent. over 1921.

Tenders received recently by the Works Department of the city of Toronto, for a bridge to connect the end of St. Clair Ave. with Don Mills Road, ranged from $584,732 to $734,859. Seven tenders in all were received.

The contract for drainage work in drainage district 2, located in Portage la Prairie, Man., has been awarded to the Lount Engineering Company, for the removal of 80,000 cubic yards of earth at 18 cents per cubic yard. The Western Drainage Company has been given the contract for the removal of 370,000 cubic yards of earth in drainage district 12, located in Rhineland and Morris municipalities, the price being 14 cents per cubic yard.

Personal

Mr. John J. O'Brien, secretary and Winnipeg manager of the Northern Construction Company, Limited, and affiliated companies, with head office at Winnipeg, left recently for Montreal. In view of the large contracts recently secured there the Northern company have decided to open an eastern office. Mr. O'Brien has been most actively connected with practically all of the larger construction work from the head of the lakes to Vancouver during the past 14 years, including the Winnipeg aqueduct, the Manitoba Power company's Great Falls hydro-electric development, and the Canadian National main line to Vancouver. Mr. R. M. Miller will take charge of the Winnipeg office.

The Minister of Public Highways, Hon. Mr. Geo. S. Henry, and party recently completed a tour of inspection on provincial highway routes throughout the province of Ontario.

Obituary

The S. Hadley Lumber Company, Limited, and The Chatham Sand and Gravel Co. announce with keenest regret the death of their president, Mr. William Arthur Hadley, at Chatham, Ontario, on Sunday, September 9th.

Frank P. Wood, president of the Burlington Steel Co. Ltd., Hamilton, Ont., who has been appointed a director of the Imperial Life Assurance Co. of Canada

CONSTRUCTIONAL ACTIVITY

Period of Sept. 12 to Sept. 18, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Beauport, Que.

The town council is having plans drawn for waterworks system costing $200,000.

Carleton County, Ont.

The county council has awarded the contract for bituminous macadam roadway to Geo. Farmer, 45 Bertrand St., Ottawa.

Fonthill, Ont.

Tenders are being received till September 25 by the town council, through the clerk, Avery Sharpe, for 3 miles of 6 in. and 8 in. watermains in connection with waterworks system. Plans and specifications with clerk and the engineers, James, Proctor & Redfern Ltd., Toronto.

Listowel, Ont.

The town council contemplates laying concrete sidewalks on Wallace, Maitland and Campbell Sts.

The laying of an 8 in. watermain to the plant of the Perfect Knit Mill is contemplated by the town council.

Logan Twp., Ont.

Tenders are being received till September 27 by the township council, through the clerk, Louie G. Rock, Bornholm, Ont., for a drain. Plans and specifications with clerk.

Moncton, N. B.

Work is to start at once on repairs to reservoir "McNutt" costing $5,000, under the supervision of J. Edington, city engineer.

Work is to start shortly for a sewer and water system costing $7,000 on Alma St., from St. George to Queen, John Edington, engineer, is in charge of the work.

Richmond Hill, Ont.

Tenders are being received till September 21 by the town council, through the clerk, A. J. Hume, for construction of a bituminous pavement on concrete base with curb and gutter, on Yonge St.

Scarboro Twp., Ont.

Tenders are being received till September 24 by the town council through the engineer, C. E. Fraser, 1361 Kingston Rd., Toronto, for construction of concrete sidewalks, together with the necessary grading. Specifications and profiles with the engineer.

Stevensville, Ont.

Tenders are being received by the clerk, M. S. Pound, Ridgeway, Ont., no closing date set, for concrete sidewalks east side Victoria St. and south side Main St.

Toronto, Ont.

The city of Toronto, through the Chairman of the Board of Control, C. A. Maguire, will receive tenders till October 23rd, for 1-1,000 Imperial gallon perminute centrifugal portable sewage pump, motor and appurtenances, at the main sewage pumping station. Specifications, etc., at room 12, City Hall.

CONTRACTS AWARDED

Edmonton, Alta.

The city council has awarded the contract for paving to Bithulithic & Contracting Co., Edmonton, at $62,410.

Etobicoke Twp., Ont.

The township council has awarded the following contracts for sidewalks; Long Branch and Humber Bay—Phillips & Brian, Humber Bay, at $2,335; Islington and Lambton Mills—J. P. Blake, Long Branch, at $2,423.

Fergus, Ont.

The town council has awarded the contract for concrete sidewalks to M. Landoni.

Lasalle, Que.

The town council has awarded the contract for extension to water and sewage systems costing $95,000. to L. O. Ott & Co. Ltd., 10 Cathcart St., Montreal.

Montreal, Que.

The city council has awarded the following contracts for pavements and sidewalks; F. Lapan, 601 Lacordaire St., $13,129; Corlier & Cie., 3506 Christope Colomb $5,937; Jules Toralli, 186 St. Margaret, $10,883.50; Quinlan, Robertson & Janin, $80,269.50; Sicily Asphaltum Paving, 60 St. Viateur E., $28,850; Leger & Lamourex, 294 St. Catherine East, $19,830.

New Toronto, Ont.

The town council has awarded the contract for concrete sidewalks to Herbert Baxter, New Toronto, at 23 cents sq. ft. and excavation at 90 cents cu. yd.

Riverside, Ont.

The town council has awarded the contract for sewers costing $75,000, to Coulatti Bros., Ouellette Ave., Windsor, Ont.

Ste. Therese, Que.

The town council has awarded the contract for sewers to Ovila Filion & Frere, 2985 St. Denis St., Montreal, at $110,000.

St. Thomas, Ont.

The city council has awarded the general contract for sewers costing $22,637, to Mitchell Contracting Co. Ltd., London, Ont.

Toronto, Ont.

The city of Toronto has awarded contracts for sewers as follows: Dundurn Ave. $823, Woodfield Rd., $1,887, Rhyl Ave., $757, Milverton Blvd., $1,743, Glebeholme Blvd., $1 763—W. E. Taylor, 22 Falcon St.; Golfdale Rd., $4,104—W. R. Worthington, 555 Markham St. Wolverleigh Blvd., $1,868—A. Cavotti, 257 Euclid Ave.

Windsor, Ont.

The city council has awarded Cadwells, Ltd., Sandwich St. W., the contract for pavement at $17,859.

Winnipeg, Man.

The contract for pavement and granolithic walks to cost $28,082, has been awarded to the city engineer, 223 James St., Winnipeg.

The city of Winnipeg has awarded contracts for granolithic walks as follows: city engineer at $7,512.50; Thos. Jackson & Sons, at $3,172.99.

The city council has awarded the contract for sewers to Thos Jackson & Sons, 370 Colony St., at $3,948.90.

York Twp., Ont.

The township council has awarded contracts for grading and pavement as follows; Killarney Rd., $3,447—Construction & Paving Co., Toronto; Durant St., $465.00—Britnell Contracting Co., Toronto.

Contracts for sidewalks have been awarded by the township council as follows: First Ave., Kirknewton Rd., Weatherall St., $1,248, $3,634, $773.00—C. O. Mathews; Barker Ave. $1,494—H. S. Walton, 60 Gamble Ave; Dundurn Ave., $1,631—A. Johnson, 35 Burgess Ave., Toronto.

Railroads, Bridges and Wharves

Burlington Centre, N. S.

The time for receiving tenders in connection with extension to wharf has been extended till September 24. Plans and specifications at Dept. office of Dist. Engineer, Bellevue Bldg., Halifax, and Post Office, Burlington Centre, N. S.

Belleville, Ont.

Tenders are being received till September 28, by the Dept. of Public Highways, through the Deputy Minister, W. A. McLean, Parliament Bldgs., Toronto. for erection and placing of a stone-filled timber crib around pier 12 etc., on the provincial highway, south of Belleville across the Bay of Quinte. Specifications with W. Noonan, Res. Engineer, Napanee, Ont., and Department at Toronto.

Beach Point, P. E. I.

Tenders are being received till October 2nd by the Department. of Public Works through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of a wharf. Plans and specifications at department office of the district engineer, Post office Bldg., Charlottetown, and Post Office, Murray Harbor.

Belle River, Ont.

Tenders are being received till October 2 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for construction of a harbor protection wall of sheet piling. Plans and specifications at offices of Dist. Engineer, Royal Bank Bldg., London, Ont., Equity Bldg, Toronto, and at Post Office, Belle River.

Toronto, Ont.
Tenders are being received by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, till October 4 for construction of 478 ft. of pier in Toronto Harbor. Plans and specifications at Dept. office of District Engineer, Equity Bldg., Toronto.

Turtle Mountain, Man.
Tenders are being received till September 29 by the municipality, through the secretary-treasurer, M. Rollins, Man., for the building of an 85 ft. pile bridge over Jack Fish Creek. Plans and specifications with Highway Commissoner, Parliament Bldgs., Winnipeg, Man.

CONTRACTS AWARDED

St. Adele, Que.
Dominion Bridge Co. Ltd., Lachine, Que., have the contract for steel in connection with $10,500 bridge. The general contractor, Alphonse Daris, Chateaugay, Que., is in the market for triangle mesh, paint and cement, f.o.b. Mount Rolland, Que.

Tilston, Man.
Lacour & Schioler, Winnipeg, Man., have been awarded the contract for 2 bridges and 2 culverts, at $7,500.

Toronto, Ont.
The city council has awarded the general contract for steel arch bridge (Vale of Avoca) to the Russell Construction Co., at $572,464. Work will start as soon as work order is issued by Commissioner of Works.

Public Buildings, Churches and Schools

Anse Aux Griffins, Que.
Pierre Levesque, architect, 115 St. John St., is preparing plans for a $28,000 church and sacristy for the R. C. Parish. Tenders will be called in October.

Guelph, Ont.
Bulk tenders are being received by the architects, Stevens & Lee, 63 St. Charles St. East, Toronto, till October 1 in connection with alterations to St. Joseph's Hospital.

Oshawa, Ont.
Tenders are being received till September 25 by the Board of Education, through the secretary, J. A. McGibbon, for all trades except plumbing, heating and wiring in connection with addition to Collegiate Institute. Alternative prices to be submitted for all necessary preliminary work; construction of a swimming pool; for proposed alterations of the present building. Plans and specifications with architects, Hutton & Souter, Hamilton, and the secretary.

Quebec, Que.
Beaule & Morissette, 21 D'Aiguillon St., are preparing plans for an addition to Hospital de L'Hotel Dieu.

St. Catharines, Ont.
Messrs. Witchall & Son, 156 St. Helens Ave., Toronto, Ont., are submitting a bulk tender, and want prices on sub-trades, in connection with terminal building to be erected for Toronto, Niagara & St. Catharines Railway.

St. Jerome, Que.
Viau & Venne, architects, 76 St. Gabriel St., Montreal, are preparing plans for a $150,000 Normal school.

Stoney Point, Ont.
Alternative tenders are being received by the architect, G. P. J. Jacques, Windsor, Ont., till September 26, for the building of a separate school. Plans and specifications with the architect.

Toronto, Ont.
Tenders are being received by the Board of Control, through the chairman, C. A. Maguire, till September 25, for concrete work and wiring for a tunnel between Nurses Home and north Isolation Hospital Building in Riverdale Park. Plans and specifications with city architect.

CONTRACTS AWARDED

Edmonton, Alta.
The following contracts have been awarded in connection with $55,899.00 school; general contract—T. Ingram, Edmonton, $55,899; plumbing, heating and ventilating—C. R. Frost, Edmonton, $17,966.00.

Hamilton, Ont.
The board of Education has awarded the contract for plumbing, heating and ventilating of new Collegiate on Main E., to Adam Clark, 7 Main West.

Kitchener, Ont.
Turnbull & Sutcliffe, Brantford, Ont., have the contract for roofing and sheet metal work in connection with $440,000 hospital being built.

Wm. Knell & Co., 45 King West, have the contract for plumbing and heating in connection with alterations and addition to House of Refuge costing $100,000.

London, Ont.
W. E. Dodd, 448 King St., London, Ont., has been awarded the general contract for an $18,000 parish hall for St. George Anglican Church, and will let sub-trades.

Montreal, Que.
Dufresne & Paquette, 13 DeL'Eglise, St. Laurent, have the general contract for repairs to institution at 340 St. Hubert St., costing $20,000.

The walls are going up for a $20,000 extension to railway depot of Montreal Southern Counties Rly., McGill St. J. H. Leboeuf, Ville St. Pierre, has the contract for mill work; roofing, plumbing and heating—H. Letourneaux, St. Lambert, Que.

Mitchell, Ont.
The following sub-trades have been let on $50,000 high school; ventilating, plumbing and heating—A. McDonald, 11 Ontario St., Stratford, at $8,652; tile—National Fireproofing Co. of Canada, Ltd., Toronto.

Newmarket, Ont.
The following sub-trades have been let on $55,000 addition to school; structural steel—Standard Steel Construction Co., Welland, Ont.; painting—Everett Scott; Newmarket; plastering—D. Millard, Newmarket.

Northside, Sask.
P. M. Hanson, Northside, Sask., has received the general contract for the erection of a school.

Outremont, Que.
Reid Bros., 2a Tower Street, have the general contract for a $20,000 hall to be built for the Outremont Presbyterian Church, and will do the masonry and carpentry work.

Oakville, Ont.
The contract for electrical work in connection with $18,000 theatre being built has been let to J. Kennedy & Son of Acton, Ont., and not to E. Sprowle, as previously reported.

Port Arthur, Ont.
The foundations are in for a $175,000 court house. The following sub trades have been let; cut stone—Gillies Quarries Ltd., Winnipeg; millwork—J. R. Eaton & Sons, Ltd., Orillia, Ont.; roofing and sheet metal—Canadian Rogers Sheet Metal & Roofing Co. Ltd., Winnipeg; marble and tile—Italian Mosaic & Tile Co., Toronto; structural steel—Hamilton Bridge Co., Hamilton; ornamental iron—Canadian Ornamental Iron Co., Toronto. Plastering and miscellaneous iron trades not yet let.

Point Grey, B. C.
The following sub-trades have been let on $45,000 fire hall being built corner Carter & 33 Aves.; general contract—R. P. Forshaw; electric—Universal Electric Co.; plumbing—Mitchell Bros.; heating—Barr & Anderson. All of Vancouver. Roofing, plastering and painting not yet let.

Prince Albert, Sask.
The following contracts have been awarded in connection with alterations to Municipal Hospital costing $16,490; general contractors—A. W. Haynes; electric— City Electrical Dept.; plumbing, heating and sheet metal—Wallace Plumbing & Heating Co.; millwork— P. A. Manufacturing Co. All of Prince Albert, Sask.

Quebec, Que.
Work is in progress rebuilding basilica costing $500,000. The following contracts have been awarded: steel sash—Richard & Frere, Engrs.,553 St. Valier St. at $11,213; glazing—Gauthier & Frere Cie., 292 St. Joseph St., at $1,240.

Toronto, Ont.
The walls are going up for a $100,000 addition to church at 310 Danforth Ave. Wm. Howard, 43 Howland Ave., has the contract for heating. Roofing, electric, painting and plastering to be let.

The following sub-trades have been let on $10,000 parish hall being built corner Monarch Park and Glebeholme Blvd.; masonry—V. Foat, 214 Coxwell Ave.; carpentry—Sands & Simonds, 15 Sproat Ave.; steel—McGregor & McIntyre; painting—Jno. Pitts, 37 Chester Ave.

The contract for heating system for church corner Ashdale and Gerrard, has been awarded to John Baxter, 334 Rhodes Ave.

W. E. Edge Ltd., 45 Richmond East, has received the contract for copper roofing on clock tower to cost $6,932.

Verdun, Que.
The National Electric Contracting Co. Ltd., Montreal, Que., have the contract for electric work in connection with $50,000 addition to St. Clements Anglican Church.

Wolfville, N. S.
The excavation work has started for a $350,000 auditorium and lecture rooms for the Acadian University. The general contract has been awarded to Rhodes, Curry Co. Ltd., Amherst, N. S.

Woodstock, Ont.
The foundations are in for an addition to Central school to cost $100,000. Sub-

trades have been let as follows: steel—Standard Steel Construction Co., Welland; roofing—Brown, Jarvis Roofing Co., Brantford; electric, plumbing, heating and ventilating—Davidson & McInnis, Woodstock.

Winnipeg, Man.
Sub-trades as follows have been let on $60,000 power house and laundry being built for the Grace Hospital; roofing and sheet metal—Geo. A. Boardman; plastering—MacConnechie & Forsythe; marble and tile—Winnipeg Marble & Tile; reinforced steel—C. A. P. Turner.

Business Buildings and Industrial Plants

Arthur, Ont.
J. W. White is the owner and general contractor of a $15,000 business block on Main St ; 2 storeys, 40 x 60.

Cap Chat, Que.
James Richardson & Co., are the owners and builders of a $20,000 saw mill.

Fort William, Ont.
I. Firlevich, 500 McTavish St., is the owner and builder of a $10,000 business block, and will purchase all materials.

Godbout, Que.
The St. Regis Paper Co. of Canada, Ltd., Montreal, contemplate building a paper mill. Will probably let general contract.

Montreal, Que.
R. Charbonneau, architect, 194 G. E. Carter Sq., is preparing plans for a $28,000 store for A. Lafortune, 5776 Sherbrooke West.

Millet, Alta.
The Edmonton City Dairy, Edmonton, Alta., contemplate the building of an $8,000 creamery and cheese factory. Work will start about November 1st.

Regina, Sask.
Tenders will be received by the architects, Storey & Van Egmond, McCallum Hill Bldg., Regina, for alterations to store costing $9,000 on Tenth Ave Plans and specifications with architects. No closing date set.

St. Jerome, Que.
The foundations are in for a $25,000 manufacturing plant for the Laurentian Timber Products Co.

Toronto, Ont.
B. Swartz, architect, 336 Dundas W., is receiving tenders till October 1 on all trades in connection with a $12,000 store and garage on St. Clair Ave. near Oakwood.

Bulk or Separate tenders are being received till October 1, by the architect, B. Swartz, 336 Dundas West, for the erection of a public garage on south side Bloor St. near Jane St.

Bulk or separate tenders are being received by the architect, B. Schwartz, 336 Dundas West, for a $15,000 store and dental suite corner Dundas and Centre Ave.

Thorndale, Ont.
W. G. Murray, architect, London, Ont., is preparing plans for a $10,000 factory. H. Jones, Belton, Ont., is the owner.

CONTRACTS AWARDED

Corbyville, Ont.
The contract for mixing and alcohol buildings for Canadian Industrial Alcohol Co., has been awarded to A. F. Byers & Co., Montreal, at $75,000

Dutton, Ont.
W. Saunders, Dutton, Ont., has the general contract for an $8,000 bank building to be built for the Royal Bank of Canada.

Ford, Ont.
The contract for heating and plumbing in connection with by-products building for the Ford Motor Co. of Canada, has been awarded to Drake & Avery Co., 103 John St. N., Hamilton.

The following contracts have been awarded on coal bunker building being erected for the Ford Motor Co. of Canada: plumbing and heating—Drake & Avery Co., Hamilton; steel sash— A. B. Ormsby Co. Ltd., Toronto.

The contract for heating and plumbing in connection with heat treat building being built for the Ford Motor Co. of Canada, has been awarded to Drake, Avery Co., Hamilton, Ont.

L. T. Beno has the general contract for an $11,000 baker shop and residence on Pillette Road for W. J. Green. Electric, plumbing and plastering to be let.

Hamilton, Ont.
John Tope, 218 Charlton Ave , has the general contract for a storehouse on Main St., for G. S. Dunn & Co.

The reinforced steel for $350,000 building on James St. N., is being supplied by the Burlington Steel Co., Ltd. Balance of sub-trades to be let in about two weeks.

Haileybury, Ont.
W. Clutchley has the contract for electrical work, and F. R. Gibson the contract for plumbing and heating in connection with $30,000 bank being erected on Main St.

Montreal, Que.
The following sub-trades have been let in connection with $25,000 addition to plant of Benellac Lithograph Co.: roofing—Metal Shingle & Siding Co.; electric—W. D. Marchand, 25 Park Ave.

The following sub-trades have been let in connection with repairs to rain house for the Congoleum Co. Ltd.; roofing—Metal Shingle & Siding Co.; plumbing—John Gordon, 301 St. Antoine; painting and glazing—Alex. Craig. Ltd.

C. Taylor, 28 Craig St. W., has the contract for Cutler Sipling mail system to be installed in $3,000,000 office building being erected on St. James St.

The following sub-trades have been let in connection with alterations to building of Canadian Express Co., on Montfort St : waterproofing—G . W. Reed, 37 St. Antoine; electric—Canadian Duplexalite Co., Ltd., 40 St. George; plumbing—R. M.Sevingy, 34 Chaboillez Square. Balance of work by day labor.

Church & Ross Co. Ltd., 10 Cathcart St., have the general contract for a factory to be built on St. Catherine St. East. for the Dominion Oilcloth & Linoleum Co. General contractor will let sub-trades and buy materials.

The foundations are in for a $1,250,000 office building south east corner McKay and St. Catherine Sts. The following sub-trades have been let: millwork—Jas. Davidson's Sons, Ottawa; painting and glazing—Alex. Craig, 41 Jurors St.; tiling—Lepage Marble Works Ltd.

Montreal East, Que.
The walls are going up for a $4,000,000 cement plant for the National Cement Co. McFarlane Douglas Co. Ltd., 260 Dorchester W., have the contract for roofing, and John Tweedle Ltd., 163 Lagauchetiere, contract for plumbing and heating.

North Temiskaming, Que.
The walls are now going up for a $15,000 hotel. J. Bougie, North Cobalt, Ont., has the general contract; electric—Geo. Hutton, Cobalt; heating—Geo. Taylor—New Liskeard. C. Delhole, North Temiskaming, the owner, is in the market for hotel equipment.

Outremont, Que.
The following sub-trades have been let on $5,000 warehouse being built at 1270 Notre Dame St.; millwork—Sterling Mfg. Co., St. Lambert, Que.; painting—Alex. Craig, Ltd., 41 Jurors St.; roofing and electric is being done by the owners, Steel Co. of Canada.

Ottawa, Ont.
Alex. Garvock, Sparks & Bank Sts., has the general contract for $60,000 addition to store in O'Connor St.

Sarnia, Ont.
Wm. Cook, Christina St., has the general contract for four stores and offices being built corner Christina and Cromwell Sts., costing $35,000. Structural steel is being supplied by the Sarnia Bridge Co.

Toronto, Ont.
The walls are now up for $40,000 addition to plant of the Ideal Bread Co , Dovercourt Rd. Following sub-trades have been let; roofing and sheet metal—W. T. Dillon & Co. Ltd ; plumbing—Purdy, Mansell Ltd. Plastering and painting to be let.

The following sub-trades have been let in connection with $150,000 addition to lunch room at 11-13 King East; marble—Ontario Marble Co., Peterbro, Ont.; ventilation—Canadian Blower & Forge Co , Toronto; electric— Nelson & Hawkins, 99 W, Adelaide. Roofing, plastering and painting to be let by the general contractor, W. T. Joy, 86 High Park Ave., Toronto.

Vancouver, B. C.
A. D. Snider & Son, Carter Cotton Bldg., have the general contract for a block of stores corner Carrall & Cordova Sts., costing $7,000 Electric plumbing and heating trades not yet let.

Woodstock, Ont.
The following sub-trades have been let in connection with $7,500 addition to factory of Woodstock Paper Box Co.: roofing—Brown, Jarvis Roofing Co., Brantford; electric, heating, plumbing & ventilating Davison & McInnis, Woodstock.

Residences

Elmira, Ont.
L. A. Jeannet, is the owner of a $5,000 residence being built, 2 stores, 28 x 22, brick construction. Work day labor by owner.

Granby, Que.
Ephrem Racine, Main St., is the owner and builder of 2 stores and residences on St. Charles St.: 2 stories, 20 x 24, frame construction.

Hamilton, Ont.
The foundations are in for a $6,000

residence on Homewood Ave. Bonner & Garnish, 129 Edgemont Ave., are the owners and builders.

Work has just started on 3 residences being built on McAnulty Blvd., costing $9,000. J. H. Holland, 63 Victoria Ave., is the owner and general contractor and will let trades.

W. Hughes, 149 Rosslyn North, is the owner and general contractor of 2 residences on Kensington South, to cost $7,000; brick construction.

Work has just started for a $6,000 residence at 218 Herkimer St. C. H. Roper, Carrick Ave., is the owner and general contractor.

T. Lewington, 15 Hilda Ave., is the owner and general contractor of 2 residences on Homewood Ave., costing $6,000, and will let trades.

G. F. Smith, 26 Carrick Ave., is the owner and general contractor of a store and apartment being built on Main, north east corner Balmoral, costing $20,000.

C. K. Jutten, 982 King East, contemplates building 9 residences on Burlington St. East, costing $15,000. 1 storey, frame construction. Roofing, plastering, heating and electric to be let.

Kitchener, Ont.

H. Alles, 90 St. George St., is the owner of a $5,000 residence to be built on Locust St. and will let all sub-trades.

Ed. Schnarr, 41 Elgin St., is the owner and builder of a $5,000 residence on Pandora Ave. Tenders are being received by the owner till September 30 for painting, electric, heating and plumbing.

L. McBrine, 73 Charles St., is having plans prepared for a $21,000 residence to be built on Maynard St.

London, Ont.

D. D. Lethbridge, 252 Briscoe St., is the owner and general contractor of a $5,000 residence at 407 McKenzie Ave.; 1½ stories, red brick veneer Construction.

London, Ont.

Tenders are being received, no closing date set, for the building of a $15,000 residence. Walter Langridge, 39 Ridout St. S., is the owner.

Montreal, Que.

M. & N. Cournoyer, 113 Desery St., are the owners and builders of 2 residences on Adam St., at a cost of $18,000. Roofing, electric, plumbing, plastering and brickwork to be let.

Lancashire Land & Construction Co., 445 Oxford Ave., are asking for tenders on all sub-trades in connection with 12 residences costing $12,000 each, on Beaconsfield Ave.

P. L. Q. Dupre, architect, 20 St. James St., is preparing plans for a residence, store and garage, corner Rosemount Blvd. and Chabot, for E. Deschenes, 580 Dorion.

Dr. A. St. Denis, 62 Dufresne, is the owner and builder of 3 residences on Logan, corner Dufresne, costing $10,000. All sub-trades to be let.

E. Chicoine, 192 Cuvillier, is the owner and builder of a $7,000 residence on Lafontaine, between St. Clement and Theodore. Roofing, electric, plumbing and plastering to be let.

F. X. St. Charles, 1297 St. Viateur, is the owner and builder of a $13,000 residence on Ontario and St. Clement.

Point Grey, B. C.

Woodburn & Chayter are the owners and general contractors of a $7,500 residence at 4362 Angus Ave. Electric, plumbing and heating not yet let.

Work is to start at once for an $8,000 residence on Nanton St. J. H. Whittaker, 1425 Burrard St., Vancouver, is the owner and builder.

N. Hercheson, 1661—49th Ave. W., is the owner and general contractor of a $10,000 residence at 1687—49th Ave. W. Electric, plumbing and heating not yet let.

Regina, Sask.

Wm. Hipperson, 1836 Hamilton St., is the owner and builder of an $8,000 residence on 16th Ave. No materials purchased.

St. Laurent, Que.

Tenders are being received by the architect, Alphonse Piche, 33 Belmont St., for all sub-trades in connection with the completion of Grey Nun's Home.

St. Catharines, Ont.

The walls are going up for a $7,000 residence on Ontario St. S. M. A. Croker, 92 Lowell Ave., is the owner and builder. Plumbing, heating, plastering, painting and electric.

Sandwich, Ont.

The excavating has started for a $12,000 residence on Partington Ave. F. Prince, Davis Bldg., is the owner and general contractor. Electric, plumbing, plastering and painting to be let.

A. J. Walker, 511 London St. E., is the owner and general contractor of a $5,000 residence on Askin Ave. Electric, plumbing and plastering trades to be let.

E. J. Baby, 15 Park St., is the owner and general contractor of a $10,000 duplex residence on West Partington Ave. Electric, plumbing and plastering to be let.

Toronto, Ont.

The foundations are in for 2 pair residences, $7,500 a pair, being built on north side Tilson Ave., near Haswood Road. M. Greenblatt, 556 Glendennan Ave., is the owner and builder.

Tenders are being received by the builders, Parkdale Concrete Co., 245 Garden Ave., in connection with a $9,000 residence and garage being built on south side Riverside Road near Mossom Road.

J. Hodgson & Son, 63 Woodmount Ave., is the owner and builder of 2 residences costing $9,000 on west side Kent Rd., near Queen Sast. Masonry by day labor. Electric, plumbing, heating, plastering and painting to be let.

The walls are going up for a $15,000 duplex residence on east side Spadina Rd., near Burton Ave. Tenders are being received by the owner and builder, T. Purton, 52 Kenwood Ave., on tiling, plastering, electric, plumbing, and heating, painting and decorating.

Alex. Hussey, 54 Ravina Crescent, is the owner and builder of 1 pair residences costing $7,000 on south side Wrenson Rd. near Pullen Ave.

Work is to start this year on 4 pair residences costing $20,000, north side Milverton Blvd., near Coxwell Ave. Gilber & Richards, 235 Wolverleigh Blvd., are the owners and builders. Plumbing, heating, plastering, painting, and electric to be let.

H. Lucas, 16 Ellerbeck Ave., is the owner and builder of a $40,000 apartment house north west corner Carlaw & Danforth Aves. Tenders are being received by the owner on electric, plumbing, heating painting and plastering. No closing date set.

Grimshaw Bros., 288 St. Clair West, are the owners and builders of a $9,500 residence on the west side Coxwell Ave., near Strathmore. Heating, plastering, plumbing, painting and electric to be let.

The foundations are in for a two family residence corner Carey Road and Cuthbert Crescent. Urban Improvements Ltd., care architects, Craig & Madill, 707 Yonge St., are receiving tenders on smaller trades.

B. E. Gersel, 70 Bellefair Ave., is the owner and builder of 1 pair residences costing $7,000 at 70-72 Malvern Ave., and will let the plumbing, heating, plastering, painting and electric trades.

A. Nelson, 7 Evans Ave., is the owner and general contractor of 2 residences being built on Baby Point Rd., near Brummell Ave., costing $10,000 each.

W. Brown, 89 Rushbrook Ave., contemplates building 1 pair residences costing $7,500 corner Rushbrook and Queen East; 2 stories, brick construction.

H. Nicholson, 61 Jerome St., is the owner and builder of a $7,500 residence on west side Windermere Ave., near Park Road. Plumbing, heating, plastering, painting and electric to be let.

Hillcrest Land Co., 71 Moore Ave., are the owners and builders of 2 residences, $5,000 each, on Moore Ave., and emoloy regular staff and buy materials as required.

Work is to start shortly for 1 pair residences at 115-7 Eight Ave., to cost $8,000. F. E. Taylor, 1824 Gerrard E., is the owner and builder. Masonry, electric, plumbing, heating, painting and plastering to be let.

Work is to start shortly for 1 pair and 1 single residence on east side Woodfield Ave., near Gerrard, to cost $12,000. Forton & Driffield, 72 Hiawatha Road, are the owners and builders.

Mr. Morran, 46 Roseheath Ave., is the owner and builder of 3 residences, $4,500 each, on Gledhill Road. Plumbing, heating, plastering, painting and electric to be let.

Work is to start shortly on 1 pair residences at 245-7 Eighth Ave., costing $7,500. C. Reginauld, 10 Gamble Ave., is the owner and builder Electric, plumbing, heating, painting and plastering to be let.

The footings are in for a $7,500 bungalow and garage on north side Raymond Ave., near Brummell. W. Brown, 18 Harshaw Ave., is the owner and builder. Electric, plumbing, heating, plastering and painting to be let.

Thos. Kilner, 26 Milverton Blvd., contemplates building 1 pair residences on north side Robins, near Pullen Ave., costing $8,000.

Work is to start shortly on 1 pair residences at 165 Brookside Drive to cost

$7,500. W. Padfield, 69 Chisholm Ave., is the owner and builder. Plastering, painting, electric, heating and plumbing to be let.

G. Reginauld, 10 Gamble Ave., is the owner and builder of 1 pair residences to cost $7,500, at 341-3—8th Ave. Electric, plumbing, heating, painting and plastering to be let. Masonry by day labor.

The foundations are in for 1 pair residences costing $7,000, at 128-130 Eglinton Ave. J. Barrett, 533 Euclid Ave., is the owner and builder.

F. Morgan, 209 Ashdale Ave., is the owner and builder of a $6,500 store and apartment, east side Greenwood Ave., near Mortimer; 2 stories, frame and brick construction.

Work is to start shortly on 1 pair residences costing $8,000 on south side Harris, near Westlake Ave. R. Muir, 20 Linsmore Crescent, is the owner and builder.

The excavation work has started for a $7,500 residence on west side Coxwell Ave., near Queensdale Ave. R. H. Breeze, 290 Glebeholme Ave., is the owner and builder. Heating, plumbing, electric and plastering to be let.

Jno. Gilbert, 35 Wolverleigh Ave., is the owner and builder of 1 pair residences to cost $7,000 on the north side Milverton Blvd., near Glebemount Ave. Owner employs regular staff and purchases material as required.

J. D. Woodhouse, 109 Moscow Ave., is the owner of 1 pair residences costing $7,000 being built on north side Milverton Blvd., near Woodmount Ave. Plumbing, painting, heating, electric and plastering trades to be let by the owner.

Excavation work has started for 2 residences at 1528-1530 Dufferin St. John Kaake, 1593 Dufferin St., is the owner, and employs regular staff. No materials purchased.

The foundations are in for 1 pair residences costing $7,000, north side Strathmore Blvd., near Woodington Ave. Paddon & Mathews, 41 Oakdale Ave., are the owners and builders.

The foundations are going in for an $8,000 residence north side Edgewood Ave., near Kingston Road. Jno. Baker, 362 Dundas East, is the owner and builder. Heating, plumbing, plastering, electric and painting trades to be let by owner.

H. E. Warrington, 222 Woodbine Ave., is the owner and builder of 3 pair residences, $7,000 a pair, on south side Glebeholme Blvd., near Coxwell; 2 stories, 32 x 36, brick construction. Owner employs regular staff and purchases material as required.

Wm. H. Myers, 90 Caledonia Road, is the owner and builder of 1 pair residences, 106-8 Caledonia Ave. Tenders are being received on electric, plumbing and heating trades.

Frankish & Frankish, 1 Walnut Ave., are the owners and builders of a $10,000 store and apartment at 1559 Danforth Ave.; 2 stories, brick construction.

D. E. Bennett, 2782 Dundas West, is the owner and builder of 2 residences on the Glebe Estate.

Stephen Janes, 82 Salem Ave., is the owner and builder of an $8,500 residence on Lacelles Ave.

W. Brown, 89 Rushbrook Ave., is the owner and builder of 3 residences on Rushbrook Ave., costing $5,000 each. Tenders are being received by the owner on carpentry work.

H. W. Kniffen, 1510 Dufferin St., is the owner and builder of 2 bungalows, $4,500 each, on east side Rushton Road, near Valley Ave. Heating, plumbing, painting, electric and plastering to be let.

The excavation work has started for 1 pair residences, $4,500 each, on south side Hatherley Road near Harvie Ave. A. Elliott, 55 Roach Ave., is the owner and builder.

J. Hart & Son, 31 Frater Ave., is the owner and builder of 2 bungalows costing $4,500 each, on west side Woodmount Ave., near Frater Ave. Heating, plumbing, painting, electric and plastering trades to be let.

The foundations are going in for 2 pair residences costing $16,000 at 56-8 Seventh Ave. W. H. Royle, 2164 Danforth Ave., is the owner and builder.

Verdun, Que.

H. Martin, 438 St. Antoine St., contemplates building 2 residences costing $15,000.

Vancouver, B. C.

S. E. Peters, 6101 West Blvd., Point Grey, B.C., is the owner and builder of a $6,000 residence at 6776 Arbutus St. Roofing, electric, plumbing, heating and plastering not yet let.

H. C. Woodcock, 940—23rd Ave. W., is the owner and builder of a $5,500 residence at 1081—16th Ave. W.; electric, plumbing, heating and plastering not yet let.

H. S. Griffith, architect, 207 Hastings St. W., is preparing plans for alterations to apartment block on Georgia St. West. to cost $385,000.

Winnipeg, Man.

Lount Engineering Co., Ltd., are the owners and builders of a $9,000 residence on west side Montrose, south of Kingsway, and will purchase material and sub-let trades.

W. E. Hill, 420 Stradbrooke St., is the owner and general contractor of a $5,200 residence on Niagara St. No materials purchased. No sub-trades let.

CONTRACTS AWARDED

Brantford, Ont.

R. S. Hope, 217 Terrace Hill St., has the contract for plumbing in connection with an $8,000 residence being built on Dufferin Ave. Electric and heating to be let.

Charlottetown, P. E. I.

McDougall & McCauley, Kent St., have the general contract for a $15,000 residence on Dorchester St., for Aubrey Brown.

Esquesing Twp., Ont.

Alfred J. Raynor, Acton, Ont., is the builder of a $20,000 residence and greenhouse, etc., for Dr. Beatty, R.R. No. 4, Acton, Ont. Plumbing, heating, painting and tinsmithing to be let.

Guelph, Ont.

The following sub-trades have been let on $65,000 Nurses Home. electric—Anderson & Pfaff; plumbing and heating—Purdy, Mansell, Ltd.; Toronto; plastering—Peter Martin, 63 Ann St.; painting and glazing—W. G. Tharby; hollow tile—National Fire Proofing Co. of Canada, Ltd., Toronto. Geo. C. Walker, 32 Tiffany St., is the builder.

Moncton, N. B.

Wm. G. Crowley, St. George St., has the contract for electric and plumbing in connection with $5,500 residence being built on Williams St.

W. J. McCarthy, St. George St., has the contract for electric and plumbing work in connection with $4,500 residence being built on Church St.

E. P. LeBlanc has the general contract for an $8,000 residence, corner Church and Victoria Sts., for Dr. A. J. Gaudet, College Bridge, N. B.

Montreal, Que.

A. Gendron, 211 Cardinal, has the general contract for a $9,000 residence on Eadie, between Church and Galt, for W. Allard, 1810 Church Ave. Brickwork, roofing, electric, plumbing and plastering to be let.

Geo. Beanger, 555 Fabre, is the general contractor for an $8,000 residence being built near 491 Fabre St. for J. A. Leclair. General contractor buying materials.

Sub-trades as follows have been let on $25,000 residence being built on 2nd Ave.: roofing and plumbing — Mr. Rogier, care 305—7th Ave.; electric—A. Lafrenniere, 468—9th Ave.; plastering—J. A. Lacombe, 2175 Chabot St.

Lavoie & Paquette, 691 St. Andre, have the contract for painting and glazing in connection with $65,000 apartment house on Blvd. Decarie, near Brillon. Plastering to be let.

The following sub-trades have been let on 2 residences being built on St. Germain, costing $15,000: masonry — P. Martineau, 157 Cuvillier; roofing—F. X. Guay, 244 Cuvillier; electric—T. Daigle, 706 Chambly.

The following sub-trades have been let on $20,000 residence being built on Pine Ave.: millwork—Daniel Cream Lumber Co.; electric—Collyer & Brock; plumbing and heating—T. O'Connell. Roofing, plastering, painting and glazing, marble and tiling to be let.

The contract for roofing in connection with 28 residences being built on Redpath, costing $150,000, has been let to Boulet & Magnan, 3156 St. Hubert Street.

The excavation work for a $60,000 residence corner Robin and Amherst, is being done by Charron Express, 510 Visitation; reinforced steel — Trussed Concrete Steel Co., Ltd. Balance of sub-trades not let.

The following sub-trades have been let on 4 semi-detached residences being built on Thornhill Ave.: M. J. Quigley, 4228 St. Catherine W.; tiling—J. R. Locker Co., 143 Mansfield. Millwork by day labor.

T. Bellehumeur, 1231 Parthenais St., has the general contract for 2 residences being built on Bourbonniere costing $8,000, for V. Presseau, 947 Dorchester West.

Guidazio & Bessozzi, 640 De L'Epee, have the general contract for 3 residences costing $27,000 on Des Erables

(Continued on page 57)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TENDERS

Township of Scarboro

TENDERS FOR SIDEWALKS

Sealed tenders, marked tenders for sidewalks, will be received by the undersigned at his office 1361 Kingston road, Toronto, up to 12 o'clock noon,

Monday, Sept. 24th, 1923,

for the construction of concrete sidewalks, together with the necessary grading, on the following streets:

Contract 4—Pharmacy Avenue, Bexhill Avenue and Westdorne Avenue.

Contract 5—Butterworth Avenue, Scotia Avenue, Warden Avenue, Macdonell Avenue.

Profiles and specifications may be seen and forms of tenders obtained at the office of the engineer.

A marked cheque or bid bond for 5 per cent. of the tender price must accompany each bid.

The lowest or any tender will not necessarily be accepted.

C. E. FRASER,
Township Engineer.

Township of Scarboro Council Chambers, Stop 19, Kingston Road. 38

City of Toronto

TENDERS for Sewage Pump Etc.

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon,

Tuesday, October 23rd, 1923,

for the following:

TENDER No. 55—One only 1,000 imperial gallons per minute, centifugal, portable sewage pump motor and appurtenances, at the main sewage pumping station.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and Form of Tender may be obtained at the Works Department, Room 12, City Hall, Toronto. Tenders must comply strictly with conditions of City By-law as to deposits and sureties, as set out in Specifications and Form of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
38 Chairman, Board of Control.

For Sale

Subject to Prior Sale

Approximately 200,000 feet of new 2 x 4 Spruce Lumber. Dressed four sides, chamferred two edges. Suitable for factory floor. We are open to receive offers for the whole or part. The Goodyear Tire & Rubber Co. Ltd., By-product Department. New Toronto, Ont. 38-41

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

City of St. Thomas

Oil Storage Tanks

The undersigned will receive proposals up to 5 P.M.

September 26th, 1923,

for the fabricating of an oil storage tank for the City of St. Thomas.

Particulars on application.

Lowest or any proposal not necessarily accepted.

W. C. MILLER,
38 City Engineer.

Sealed tenders addressed to the undersigned, and endorsed "Tender for East pier of Eastern Channel, Toronto Harbour, Ont.," will be received at this office until 12 o'clock noon,

Thursday, October 4th, 1923

for the reconstruction of 478 feet of the superstructure of the East pier of the Eastern Channel to Toronto Harbour, Toronto, York County, Ontario.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, and at the office of the District Engineer, Equity Building, Toronto, York County, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa September 13, 1923. 38-39

VILLAGE OF FONTHILL

Tenders for Laying Water Mains

Sealed tenders marked and addressed to the Clerk, will be received until 8 p.m.

September 25th, 1923,

for the laying approximately three miles of 6" and 8" water mains, in the Village of Fonthill.

Plans and specifications may be seen at the office of the engineers, James, Proctor & Redfern, Limited, 36 Toronto Street, Toronto, or at the office of the Village Clerk, Fonthill; Ontario.

The lowest or any tender not necessarily accepted.

COLONEL SHARPE, Reeve
AVERY CLARK Clerk

JAMES, PROCTOR & REDFERN, Limited,
Consulting Engineers,
36 Toronto Street,
TORONTO.

38

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of south pier at Burlington Channel, Ont.," will be received at this office until 12 o'clock noon (daylight saving),

Thursday, September 27th, 1923,

for the reconstruction of the south pier, consisting in the construction of a retaining wall for a length of 489 feet, at Burlington Channel, County of Wentworth, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the office of the District Engineer, Equity Building, Toronto, Ont., and at the Post Office, Burlington, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p. c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 6, 1923. 37-38

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

Tenders for Fencing

Sealed tenders will be received for wooden fencing around Hillcrest Yard Bathurst Street and Davenport Road, Toronto. Tenders are to include all of the work contemplated.

All tenders are to be endorsed "Tenders for Fencing, Hillcrest Yard," and are to be addressed to the Chairman of The Toronto Transportation Commission and must be delivered to the offices of the Commission, 5th floor, Public Utilities Building, 35 Yonge St., Toronto not later than noon on

Monday, September 24th, 1923,

All tenders must be on the Commission's form of tender and must be accompanied by an accepted bank cheque payable to the Toronto Transportation Commission for two and one half per cent 2½% of the amount of the tender.

Plans and specifications, form of tender and instructions to bidders may be had on application to the Commission's Building Dept., third floor, 35 Yonge Street, Toronto.

The lowest or any tender not necessarily accepted.

H. H. COUZENS,
H. H. COUZENS, General Manager,
TORONTO TRANSPORTATION
COMMISSION.
38

Jaw Crusher Wanted

Wanted to purchase—twenty four by thirty-six inch or larger Jaw Crusher. Will consider No. 8 or 10 Gyratory Crusher. Machines must be manganese fitted. Mail full particulars immediately to Mussens Limited, Philips Place Bldg., Montreal. 38

For Sale

One 2" Goold, Shapley & Muir Gasoline driven plunger type pump in good condition. The Schultz Brothers Co. Limited, Brantford. 38

For Sale

Model 28—Marion Steam Shovel with clamshell attachment.
1—No. 2 Mitchell Jaw Crusher (new)
Several screen sections, 48" standard Austin screen.
1—2½" Centrifugal Pump
1—60 H.P. Locomotive type boiler.
1 60'—Barber Greene Portable Conveyor.

Above equipment may be seen at our quarry at Hagersville, Ontario.

Hagersville Quarries Limited, 4 Flora Street, St. Thomas, Ont. 37-39

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6' 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3,000 pair Blankets.
Cookery Outfit.

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Silica Brick Plant for Sale

Apply for particulars to The Schultz Brothers Co. Limited, Brantford. 38

Residences

CONTRACTS AWARDED

(Continued from page 55)

between Mt. Royale and Gilford, for Mrs. N. A. Maranda, 2100 Park Ave.

The following sub-trades have been let in connection with $26,000 residence being built on Maplewood: electric—Mr. Lafontaine, 780 Lacombe; plastering—Mr. Lamontagne, 1350 Fullum; painting and glazing—Mr. Migneron, Cartierville.

Forget & Pelletier, 960 Ferland, have the contract for plumbing, and Girard & Girard, 434 Nicolet St., the plastering in connection with $8,000 residence being built on Nicolet St.

Montreal West, Que.

C. A. Bourdeau, 195 St. Catherine East, has the contract for millwork on $10,000 residence being built on Ballantyne Ave. Balance of sub-trades to be let shortly.

The following sub-trades have been let on $12,000 semi-detached residence being built on Wolsey Ave.: masonry—P. A. Goyette, 976 Tupper St.; roofing—Dominion Sheet Metal Works; electric—E. A. Gregory, 842 Notre Dame West; plastering—E. Mantel, 444 Mount Royal E.; painting—J. Price, 715 Belmont Ave.

Outremont, Que.

Rabinovitch & Hersovitz, 276 Colonial Ave., have the general contract for a $75,000 apartment house being built for J. Gersovitz. All sub-trades to be let.

The following sub-trades have been let on $18,000 cottage being built on McCulloch, near Mt. Royal: roofing—D. St. Amour, 81 Turgeon; electric—E. Labelle, 453 Decarie Blvd.; tiling—Dussard, Joly & Mongeon, 502 St. Catherine E.

Ottawa, Ont.

R. M. Arthur, 15 Arlington St., has the general contract for a $14,000 residence being built on Driveway, for Percy Sparks, 3 Kent St.

Cowie & Moore, 414 Sunnyside Ave., have the general contract for a double residence on Russell Ave. costing $8,000, for Henry Nitzke, 249 Russell Ave.

Point Grey, B. C.

M. G. Hunt, 2327 Collingwood St., Vancouver, has the general contract for a $5,000 residence at 3921—13th Ave. W., for J. McRobbie, Vancouver.

Regina, Sask.

Jno. Steel, 8 Farmers Building, Regina, has the general contract for a $5,000 residence on Albert St. for W. L. McGillvray.

Rosetown, Sask.

Campbell & McDonald, Rosetown, Sask., have the general contract for a $7,500 residence being built for R. Dingwall, Rosetown. W. L. Powers, has the contract for plumbing and heating.

Sarnia, Ont.

Myles Somerville, 263 Essex St., is the owner and builder of a $5,000 residence on south side Essex St. Masonry—T. Grace, Christina St.; roofing—Laidlaw Belton Lumber Co., Devine St. W. Botton, Mitton St., has the general contract for a $5,000 residence on south side Richard St., for Ivan Walker, 139 Brock St. S.

Sandwich, Ont.

H. Winch, Church St., has the general contract for a $5,000 residence on Indian Road for I. Dufour, Mill St. Electric, plumbing and plastering to be let.

Truro, N. S.

The general contract for $12,500 rectory to be built for the St. John's Anglican Church, has been awarded to Frank McCurdy, 102 Willow St., Truro.

Toronto, Ont.

The following sub-trades have been let on 1 pair residences at 2-4 Lawlor Ave., costing $8,000; electric—Taylor Bros, 25½ Norwood Ave.; heating—Mason & Allen, 400 Morley Ave.; plumbing—J. Fraser, 803 Danforth Ave.; plastering—J. McKenzie, 19 Queen Victoria Ave.

M Lipsky & Co., 215 Bellwoods Ave., has the contract for plastering in connection with additions and alterations to 2 residences for store costing $15,000 at 10-12 Bloor East.

The following sub-trades have been let on 1 pair residences north side Wrenson Rd.; electric—A. Byford, 302 Glebemount Ave.; heating—Howard Furnace Co.,881 Yonge St.; plastering—Hope & Tapper, 111 Coxwell Ave.

National Fireproofing Co. of Canada, Ltd., Toronto, have the contract for tile in connection with $18,000 residence and garage being built north side Austin Terrace and Lydhurst St. Tenders being received by the general contractors, Graham & Sibbett, 9a Wellington East, on plumbing, plastering, tiling, heating and electric.

The following sub-trades have been let on pair residences being built north west corner Gerrard E. and Morton; electric—W. J. Crone, 27 Sparkhall Rd.; plumbing—W. J. Stratton, 314 Lee Ave.; heating—Toronto Furnace Co., 35 Golden Ave. Painting, by day labor.

C. Best, 244 Hastings Ave., is the owner and builder of 2 residences south east corner Monarch Park and Poulton Ave., costing $10,000. Masonry work is being done by Mr. Barriette, care of owner.

The walls are going up for 2 stores and apartments at 694-6 College St. Steel is being supplied by McGregor & McIntyre. Tenders are being received by the owner, J. H. Jolly, 702 College St., on roofing, electric, plastering, and painting.

N. B. Grandin, 26 Sydney St., is superintending the building of a $9,500 residence and garage on west side Lauder Ave., near Cloverlawn, for Mrs. A. Foster, 986a St. Clair Ave. West. Tenders are being received by superintendent on all trades.

A Spicer, 122 Barrington Ave., has the contract for masonry work on 1 pair residences on west side Hastings Ave., above Gerrard East. Plumbing, heating, plastering, painting and electric to be let.

A. B. & J. H. Cairns, 95 Gates Ave., are the owners and builders of 4 pair residences on east side Larchmount near Queen East, costing $26,000. Bonar &

Grant 1396 Main St., have the contract for masonry work.

W Brown, 89 Rushbrook Ave., is the owner and builder of 1 single and 1 pair residences to cost $11,000 on Rushbrook Ave. Masonry — T. & S. Tims, 1361 Danforth Ave. Electric, plumbing, heating, painting and plastering trades to be let.

Bonar & Grant, 396 Main St., have the contract for masonry in connection with 1 pair residences costing $8,000 on east side Larchmount, near Queen East. Plumbing, heating, plastering, painting and electric to be let.

W. D. Parker, 70 Eighth Ave., is the builder of 2 residences, $6,000 each, east side Cannon, near Eastwood Ave., for C. H. Hanwell, 335 Coxwell Ave. Plumbing, heating, plastering, painting and electric to be let.

The excavation work has started for 1 pair residences costing $8,000 on the north side 8th Ave. F. Tunnard, 114 Lawlor Ave., is the owner and builder. Masonry work is being done by Mr. Brown, 131 Willow Ave. Plumbing, heating, electric, plastering and painting to be let.

A. F. Jeffery, 1 Meagher Ave., is the builder of a $7,000 residence on west side Kingston Road, near Edgewood Ave.; 2 stories, 23 x 35, brick construction.

The plumbing and heating contract for $9,500 bungalow and garage, south west corner Patterson and Glendale, has been let to R. T. Hearn & Co., 1369 Queen St. West. Plastering and painting trades to be let.

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Verdun, Que.

The following sub-trades have been let on 2 residences being built on Verdun Ave., at a cost of $16,000: roofing—A. Despatie & Co.; plumbing—Frs. Lepine & Co. Electric and plastering to be let.

Vancouver, B. C.

D. Brand Watt, 1471—11th Ave. W., is the architect and general contractor of a $6,000 residence at 1671 Harwood St., for W. Irwin, Vancouver Hotel Vancouver.

Westmount, Que.

M. J. Quigley, 4228 St. Catherine, W., has the contract for heating, and J. R. Locker Co., 143 Mansfield, the tiling, in connection with 4 semi-detached residences being built on Thornhill Ave.

Walkerville, Ont.

Wm. Buttery, 605 Moy Ave., has the general contract for a $5,000 residence on Victoria Ave., for A. E. McGilvary, 37 Moy Ave. Electric, plumbing and plastering to be let.

John Catlin, 330 Lincoln Road is the general contractor for a $6,000 residence on Victoria Ave., for Chas. W. Shortman, Sandwich, Ont. Electric, plumbing and plastering to be let. No materials purchased.

Windsor, Ont.

C. P. Chesebro, 185 Windermere Rd., Walkerville, Ont., has the general contract for a $4,500 residence on Lawrence Rd., for J. W. McKinney, Detroit, Mich. Electric, plumbing, plastering and painting to be let. No materials purchased.

Bateman & Tesch, Albert St., have the contract for plumbing and heating of $5,000 residence being built on Parent Ave.

Power Plants, Electricity and Telephones

Chemainus, B. C.

The Victoria Lumber & Mfg. Co., are having plans prepared for a $30,000 power plant and stack for their sawmill, to house seven boilers generating 4,600 horse power. Tenders will be called soon.

Digby, N. S.

The town council contemplates the purchase of oil engines to replace steam engine now in use, for generating electricity for lighting purposes.

London, Ont.

Utilities Board are having plans prepared for the remodelling of No. 1 substation and instal additional equipment to relieve overloading.

Montreal, Que.

The Standard Paper Box Co., 2724 Park Ave., are in the market for an 80 H.P. boiler.

Toronto, Ont.

The Toronto Hydro Electric System are having plans prepared for a substation on south east corner Danforth Ave. and Morton Road. Work on this building is expected to start this Fall.

CONTRACTS AWARDED

Ford City, Ont.

The contract for heating and plumbing in connection with $300,000 power house and screen house for Ford Motor Car Co. of Canada, has been awarded to Drake Avery Co., 103 John St. N., Hamilton, Ont.

Portsmouth, Ont.

McKelvey & Birch, Ltd., 69 Brock St.,

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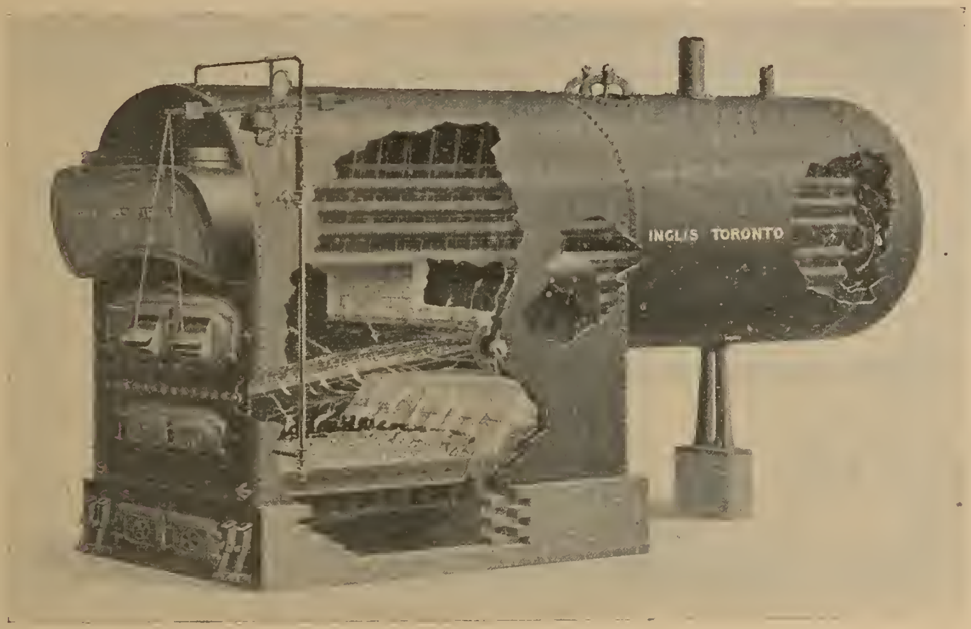

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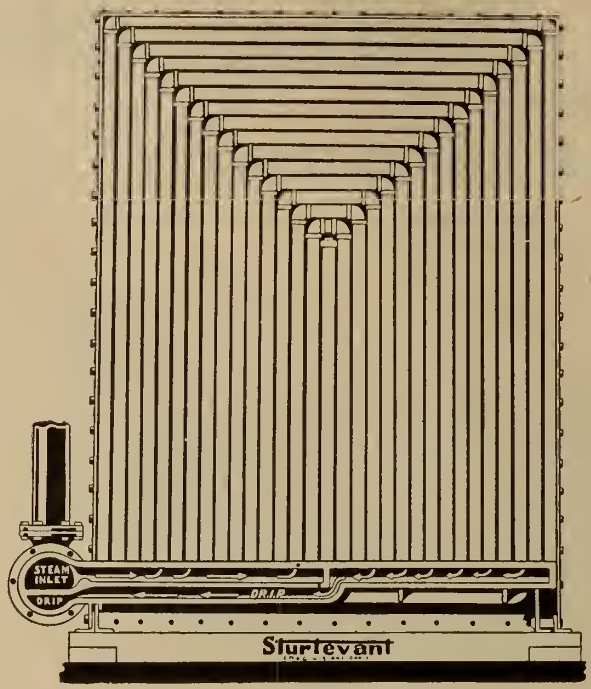

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of Canada, Ltd.
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Sturtevant
PUTS AIR TO WORK

Kingston, Ont., have the general contract for an $18,000 boiler house for the Rockwood Hospital.

Vancouver, B. C.

J. Coughlin & Sons, False Creek, B.C., have the general contract for repairs and new roof costing $15,000 for the steam stand-by plant of the B.C. Electric Railway.

Miscellaneous

Port Greville, N. S.

Tenders are being received till October 2 by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for repairs to breakwater, consisting of construction of cribwork 170 ft. long. Plans and specifications at department office of Dist. Engineer, Bellevue Bldg., Halifax, and Post Office, Port Greville.

Thessalon, Ont.

Tenders are being received till October 3 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for a $15,000 breakwater extension. Plans and specifications at Dept. offices of Dist. Engineer, Post Office Bldg., Sault Ste. Marie, Equity Bldg., Toronto, and Post Office, Thessalon, Ont.

Tiverton, N. S.

Tenders are being received till October 2 by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for a breakwater extension. Plans and specifications at Dept. Office of district engineer, Bellevue Bldg., Halifax, and at Post Office, Tiverton.

CONTRACTS AWARDED

Belle River, P.E.I.

The contract for breakwater extension to cost $7,828, has been awarded to Wellington Compton & Alex. J. Ross, Flat River, P.E.I.

Essondale, B. C.

The general contract for a $20,000 dyke has been awarded to A. B. Palmer & Co., Vancouver, B. C., on unit basis.

Pictou, N. S.

The contract for dredging to cost $10,576.76 has been awarded to Atlantic Dredging Co., Ltd., Louisburg, N.S.

Winnipeg, Man.

J. S. Sutherland, of Dayton, Ohio, contemplates the establishment of a pulp mill in Winnipeg, with a capacity of 100 tons per day. Estimated cost of the proposed plant is $1,250,000.

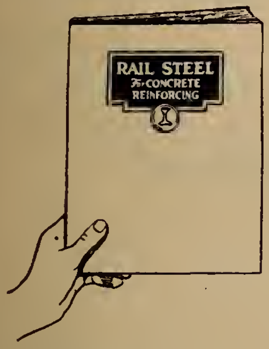
Painting Structural Steel

Structural steel should have at least two coats of red lead paint, and each coat, no matter how many, should be slightly colored, in varying degrees, so that the inspector may readily detect faulty work. A little lampblack with the red lead will do for the purpose, and this black is itself a useful addition in securing a uniformity of the thickness of the film. Graphite and lampblack are sometimes added to red lead paint, the purpose being to cause the red lead paint to work easier under the brush than the red lead paint alone will do, for it is a very stubborn liquid to spread out.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

Toughness

A material which possesses toughness is defined by Webster as one possessing flexibility without brittleness; capability of resisting great strain or severe abuse; strength. The enormous strain which railroad rails receive in track service is ample proof that they possess toughness to a very high degree. They withstand, unprotected, the pounding of heavy equipment, whereas the reinforcing bars rolled from these rails are imbedded in concrete and although constantly stressed they are not directly subjected to shock and impact. The logical conclusion, therefore, is that rail steel having proved its ability to withstand abuse as a rail, unprotected by any surrounding medium, possesses the quality of toughness and that this same steel rolled into reinforcing bars, the additional heating and rolling of which still further improves the steel, also possesses toughness. Then, when the bars are imbedded in concrete they possess resistance to stress far in excess of any demands that will ever be made upon them as a concrete reinforcement.



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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

In 1917, Professor Talbot, of the University of Illinois, conducted a series of tests on the Western Newspaper Union Building which was being wrecked for the new Union Passenger Station. This building was nine years old and of the flat slab type reinforced throughout with rail steel reinforcing. After various loadings which failed to exceed the elastic limit of any of the bars, a weight of about 1600 lbs. was dropped on the floor, above the column capital of the floor below, until the capital and the slab had been entirely shattered. This same method was followed on the floor slabs between columns until the bars were entirely exposed. The bars were then cut out with an acetylene flame. It should be noted that after this severe abuse the bars had to be cut—they did not break under the terrific impact of the weight, which is conclusive proof that Rail Steel Bars possess excess toughness as a reinforcing medium imbedded in concrete.

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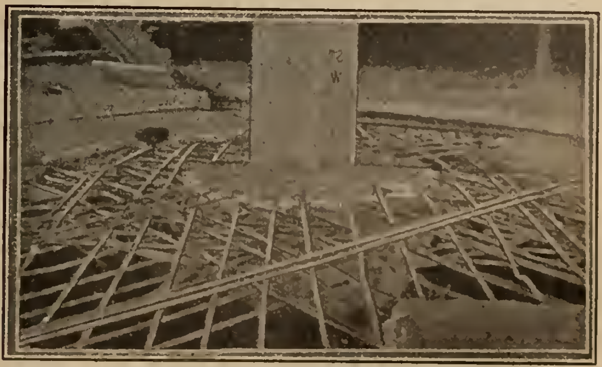

Arrangement and condition of bars around column

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Swing Check
VALVES

Fig. 481 FLANGED

For use for connections between a fire protection system having an auxiliary supply that is pumped and a municipal water supply.

Approved by the Ontario Provincial Board of Health and passed by the Factory Mutual Fire Insurance Companies Inspection Department these Swing Check Valves give that dependable service always to be found in Jenkins Diamond Marked Valves. Their design is such as to resist corrosion and disarrangement of parts. Equipped with a renewable disc of special composition, bronze hanger, seat ring and disc holder.

A Diagram showing correct installation of these Valves will be found on page 49 of Jenkins Catalog No. 9—free on request.

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WALKERVILLE, ONT.

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$1.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*'	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand-lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	[illegible].00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.10 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs	4.25 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50-6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
VITRIFIED CLAY PRODUCTS:—Discount on flue linings is 55%

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.50	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market. Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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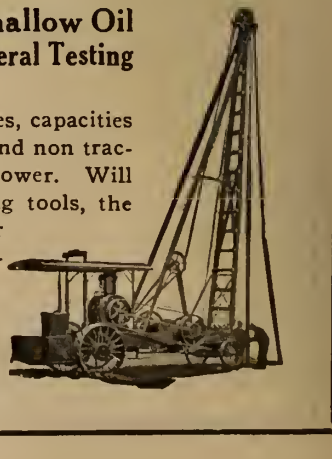

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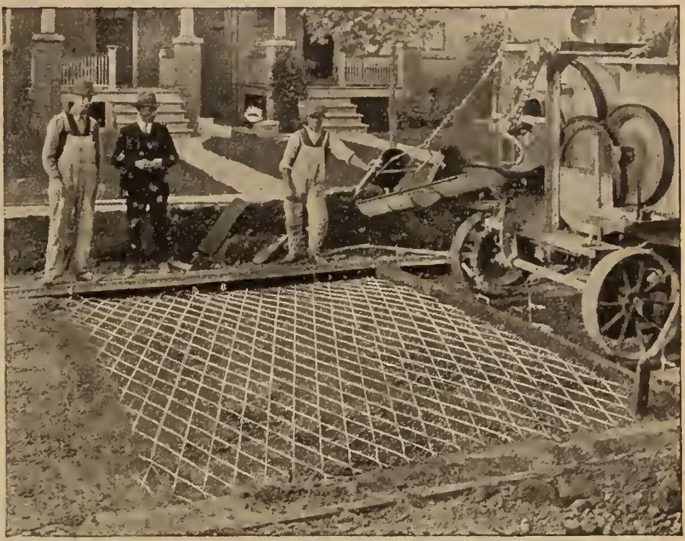

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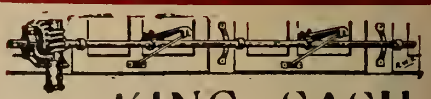

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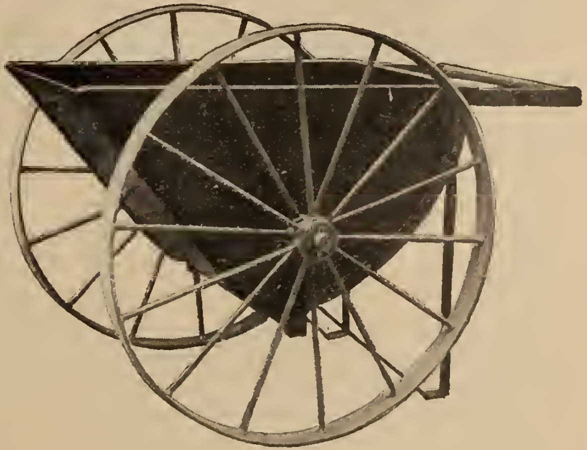

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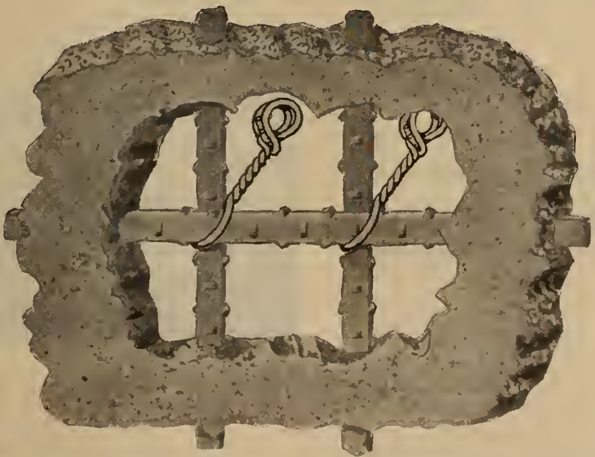

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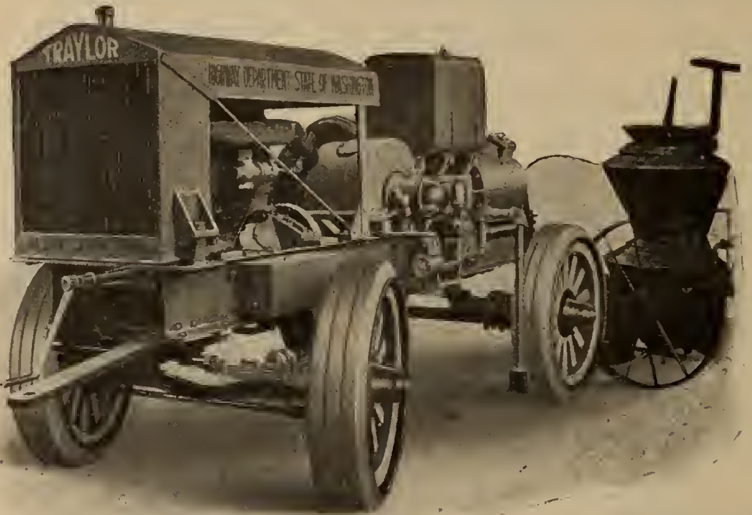

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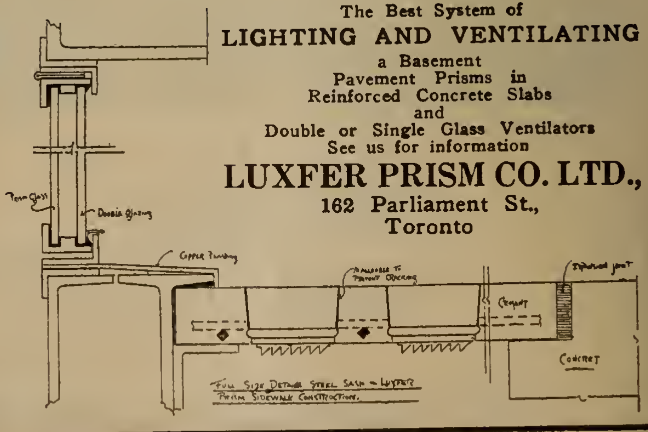
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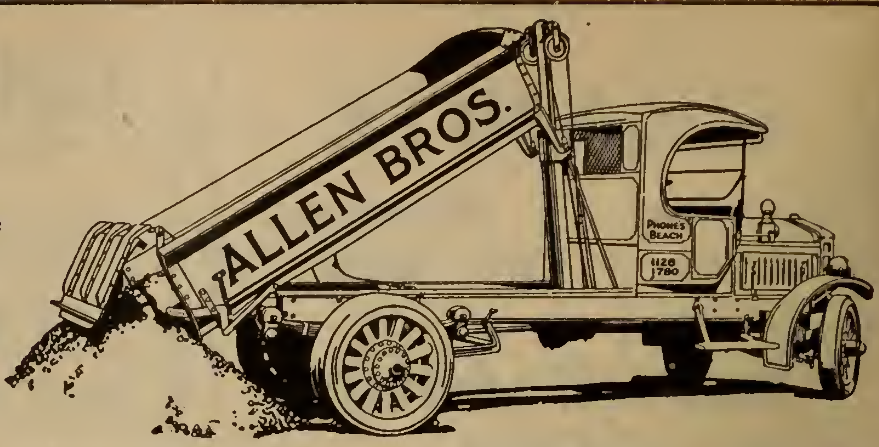

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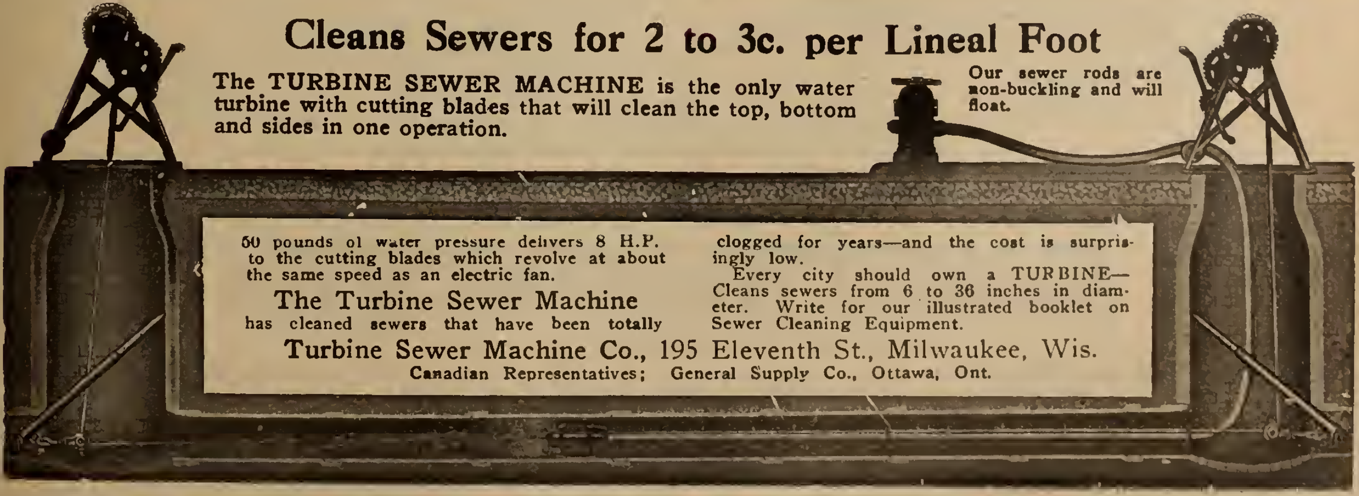

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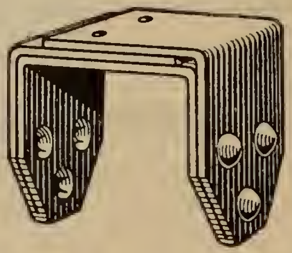

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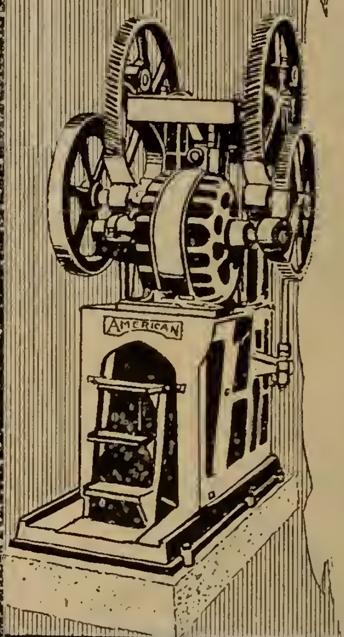

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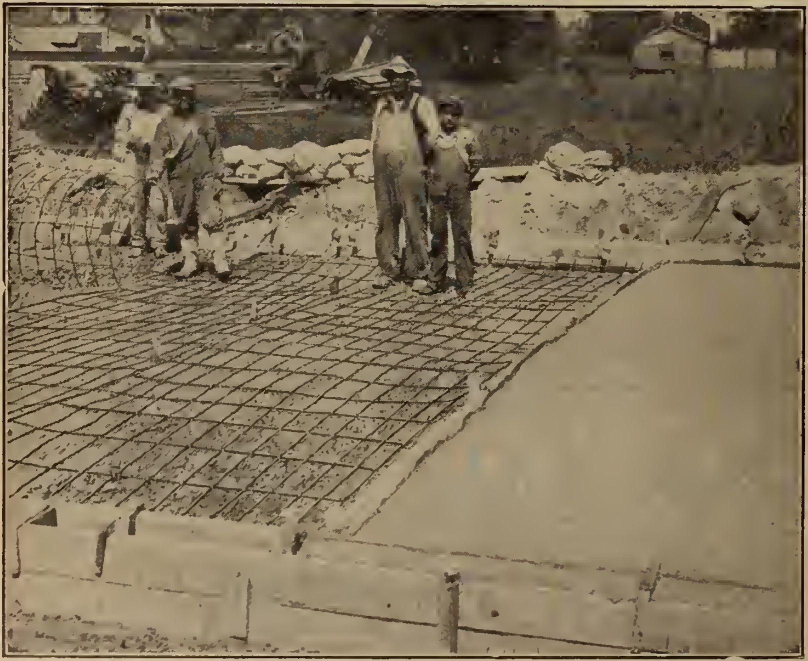

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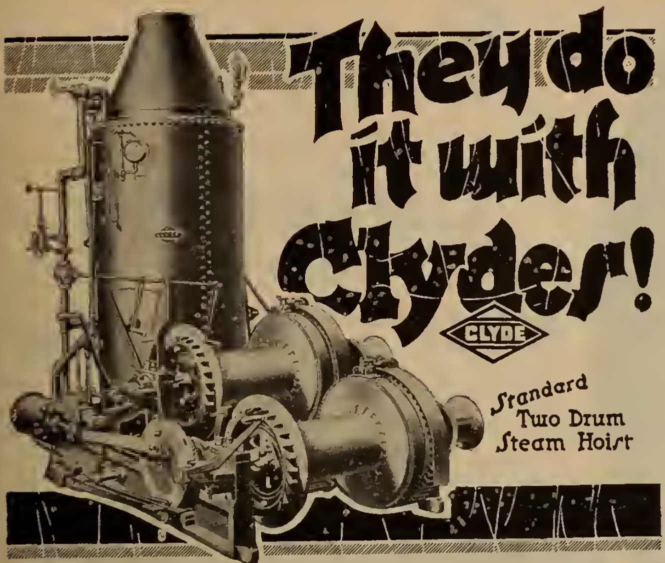
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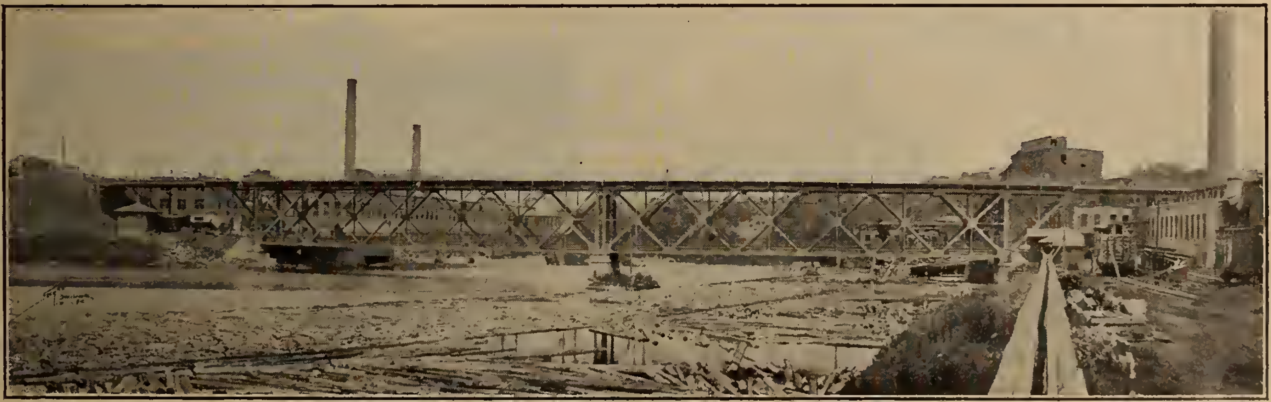

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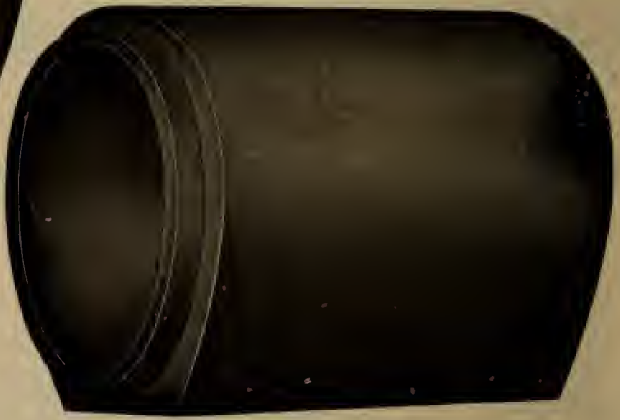

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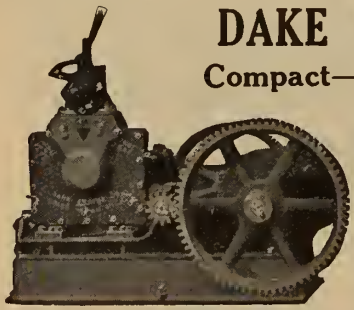

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Vol. 37 Toronto, September 26, 1923 No. 39

Contract Record and Engineering Review

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Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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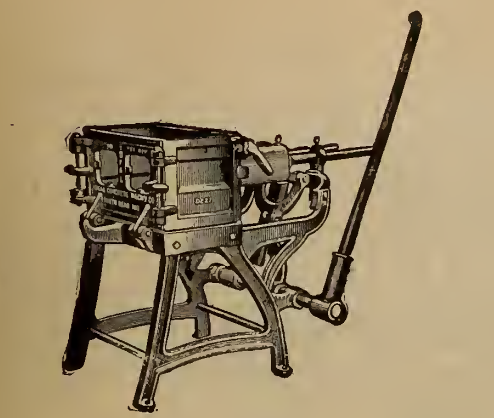

Fig. 910

IDEALCONCRETE BLOCK MACHINES THE WORLD'S STANDARD

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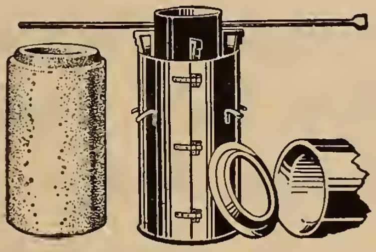

Fig. 95.

LONDON CULVERT TILE AND SEWER-PIPE MOULDS

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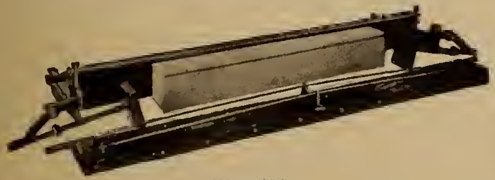

Fig. 430

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The Foundation Company of New York and Chicago, the biggest concern of its kind in the world, built the foundations and did all of the concrete work for this great bridge across the Missouri River, near Bismarck, North Dakota. The river bed is formed of silt, over a deep stratum of stiff clay, and it was necessary to carry the foundations down to a depth of 70 feet to reach this clay and insure permanency.

The bridge proper consists of three main spans, 476 feet each, centre to centre, with concrete approach on curve, about 400 feet on the east and 600 feet on the west end. The deck provides a roadway 27½ feet wide and two 6-foot walks.

Two 3-ton Plymouth Locomotives were used for hauling the concrete for the foundations and at no time did the Plymouths keep the job waiting.

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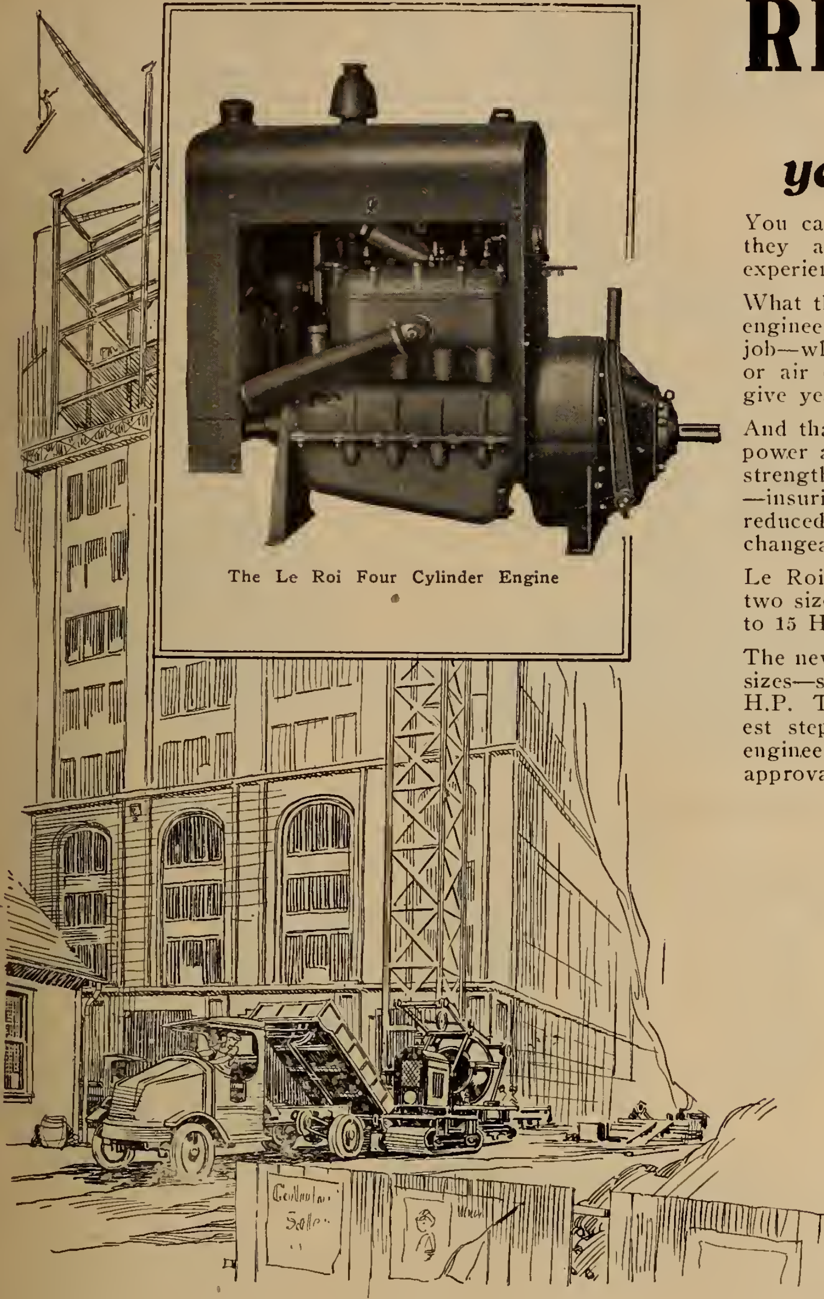

The Le Roi Four Cylinder Engine

RELIABILITY

backed by years of reputation

You can have confidence in Le Roi Engines. For they are backed by years of engine building experience.

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Le Roi Radiator cooled type engines are made in two sizes—two and four cylinder—furnishing from 5 to 15 H. P.

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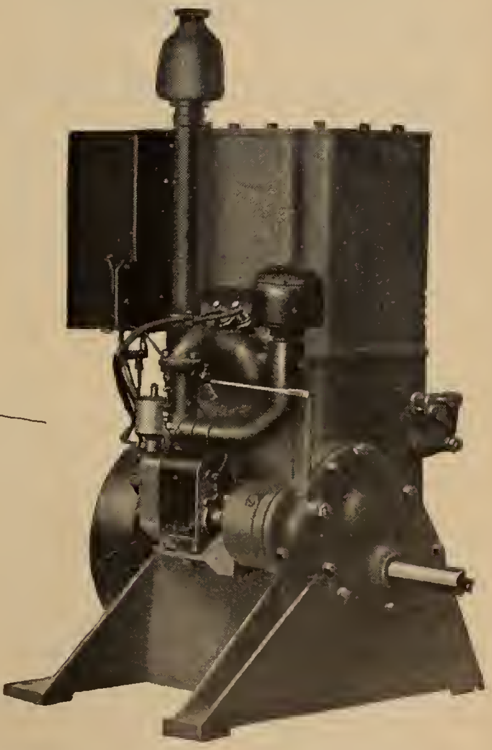

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"for dependable power"

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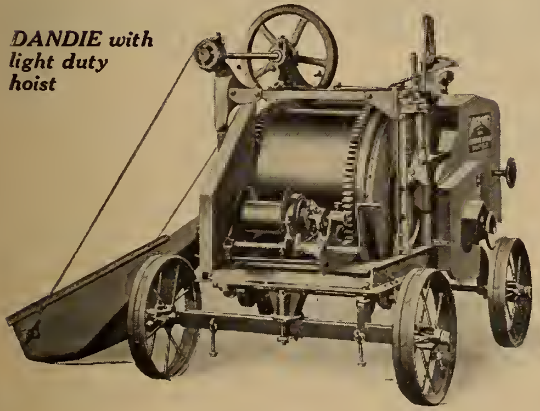

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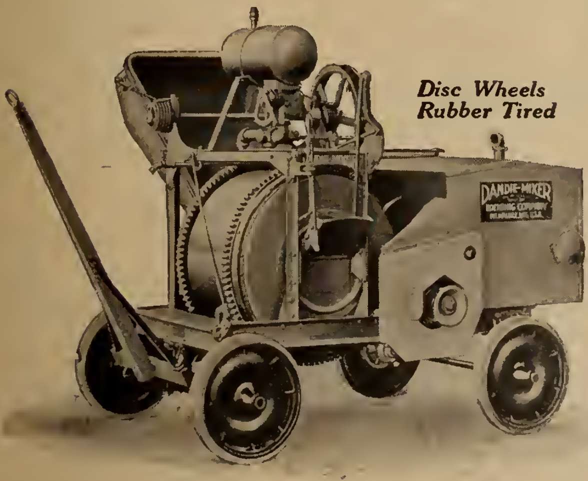

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(Continued on page 10)

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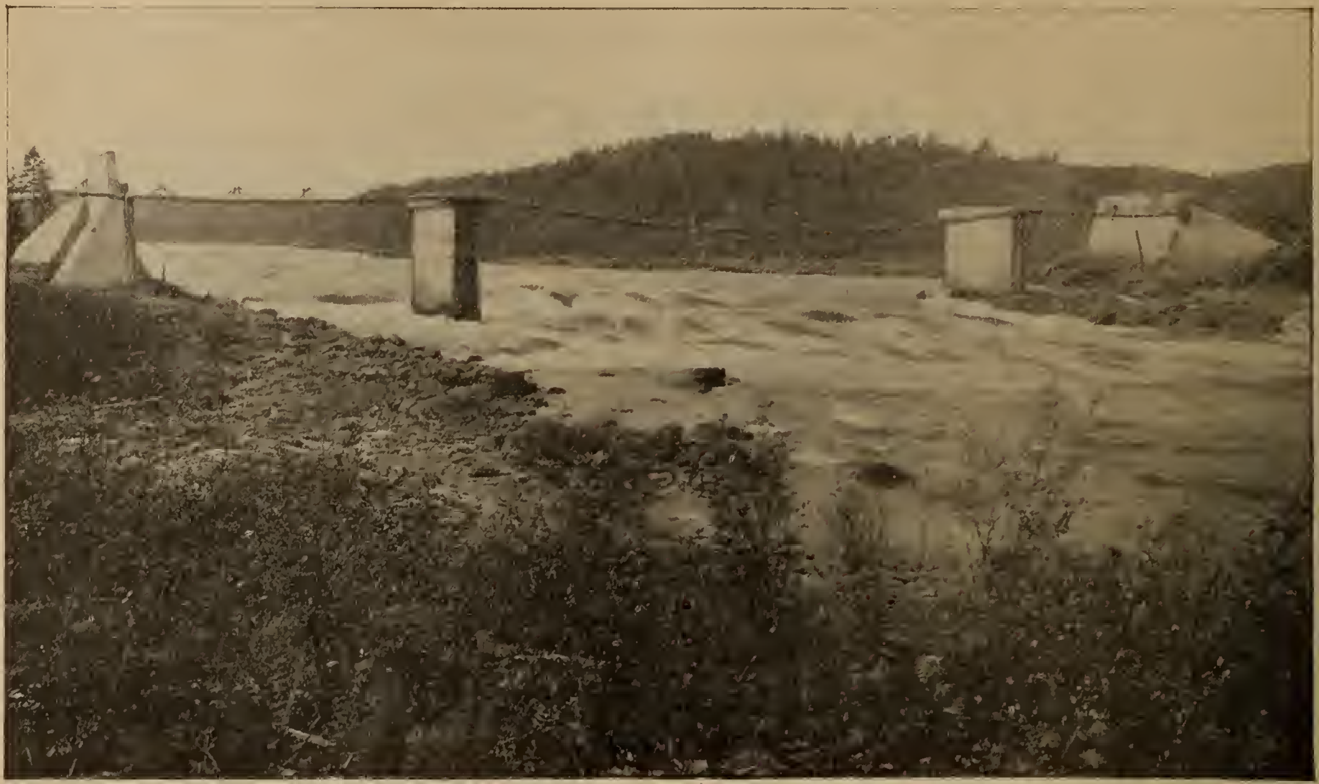

Grand Discharge, Lake St. John, P. Q., Showing Railway Piers.

HARNESSING THE WATERS OF LAKE ST. JOHN

The illustration shows concrete piers erected by the Wm. I. Bishop Company, Limited, for a railway bridge at Lake St. John, P.Q.

This bridge is an important link in the 12 mile standard gauge road destined to connect Grand Discharge with the C.N.R. line which runs from Quebec City to Lake St. John.

The Grand Discharge site being isolated from railways and distributing centres this railroad was required as one of the preparatory steps to the completion of a Development which will give to the Province of Quebec the tremendous power potentialities of Lake St. John.

Mr. W. I. Bishop is Consulting Engineer for the Quebec Development Company.

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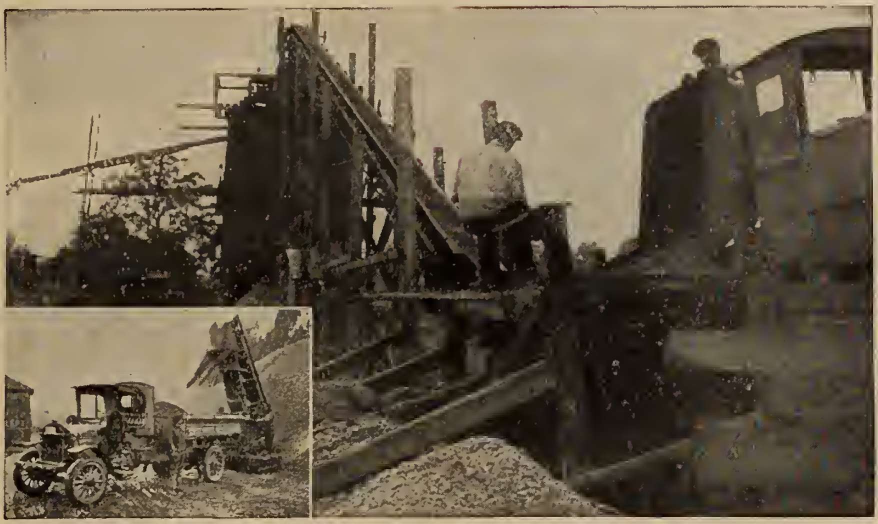

One of the Barber-Greene Conveyors whose work is described on this page.
The photograph in the corner shows a Barber-Greene Bucket Loader loading trucks.

Increasing washed and screened gravel production 350 tons per day

By replacing a bucket elevator system with two Barber-Greene conveyors the White Marsh Sand and Gravel Company near Baltimore jumped up its production of washed and screened gravel from 50 tons a day to 400 tons.

And there have been no repairs since last July.

Two Barber-Greenes are used. One is a 96-foot permanent unit on which a 15 horse-power LeRoi engine drives the belt and 36 in. x 48 in. rotary screen.

The other is a 22-foot Portable and is used to load trucks from a ground storage pile. In another plant this company has a similar Barber-Greene installation.

The gravel handled is washed and screened and carried to bins or to a storage pile across the railroad track shown in the photograph reproduced above.

As hot weather reduces production

Because of high wages and keen demand the influence of warm weather in cutting down production will be more important than it has been for some years. The use of good conveyor installations that will make plants as independent of men as possible, will therefore be even more profitable than usual.

Even more than in other years, Barber-Greene installations in sand and gravel plants are increasing as the hot weather approaches. Men are scarcer than usual and the demand for production in many regions is stronger than usual.

Because of their flexibility and low repair cost, Barber-Greenes are therefore in even greater demand than usual for handling sand and gravel.

This increased use includes both large and small plants—and both primary and supplementary equipment.

Some recent installations handle the entire production of plants with Barber-Greene Bucket Loaders and Portable Conveyors.

In other cases, as in the one described above, the Barber-Greenes are supplementary equipment handling only part of the output.

For additional information about Barber-Greene Loaders and Portable Conveyors, and how they are being used to make up for the shortage and high cost of labor, send for our N cost reports and catalog.

Ask our nearest office for particulars

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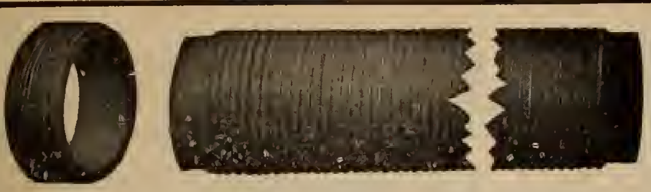

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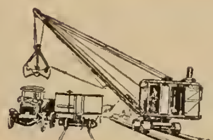

Any ERIE easily and quickly changed over to locomotive crane for unloading cars of stone gravel, etc.

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Bulletin No. 201 gives complete details of our Standard Gauges

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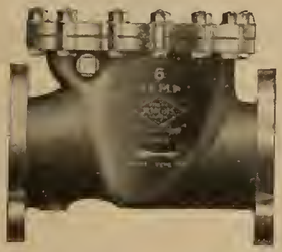

Fig. 481 FLANGED

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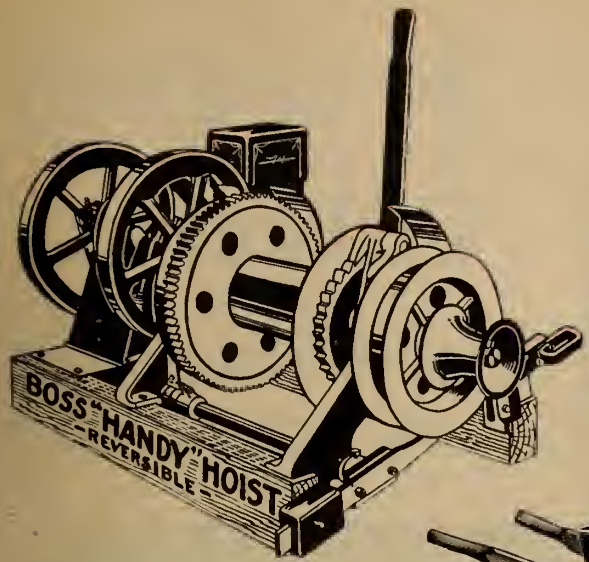

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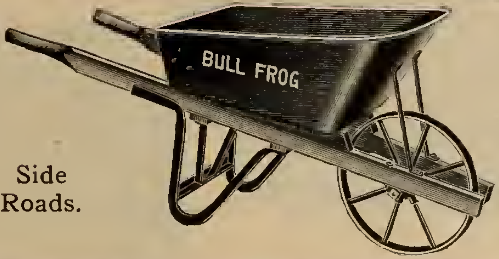

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Calcium Chloride in Concrete

The results secured in recent investigations were such that the Illinois Division of Highways was satisfied that calcium chloride could be incorporated in concrete to advantage under certain conditions. Consequently, its usage is allowed in cold weather construction upon the permission of the engineer in charge of the job. To insure the proper supervision, the department has issued a circular explaining how this material must be used. The circular reads as follows:

"The department will permit the use of calcium chloride in the concrete mix for pavement construction during cold weather. When used, the solid, granulated, flaked, or powdered materials shall be thoroughly dissolved in water. It is recommended that the proper amount of calcium chloride solution should enter the mixer drum just before the water is added to mix the aggregates, or the solution may be added direct to the stone or sand when in the skip.

"When used in the pavement work, not more than two per cent by weight of the cement shall be used.

"Calcium chloride should not be used in a pavement that crosses an electric railroad, but its use should be discontinued approximately one quarter of a mile from the electric railroad crossing. There is no objection to using the material when the highway parallels an electric line. Calcium chloride shall not be used in pavements which are reinforced.

"It is not definitely known at what temperature concrete will freeze when the two per cent of calcium chloride is mixed with the concrete and it will, therefore, be necessary to arrange to cover the pavement with loose straw or earth as soon as it has taken sufficient set to prevent marring of the surface. In other words, calcium chloride hastens the setting of concrete but is in no sense a protective. It makes possible an earlier application of a straw or earth covering.

"Due to its action on reinforcing steel, calcium chloride shall not be used in bridge or culvert construction; therefore, the usual precautions should be taken when placing concrete in culverts and bridges during temperatures around freezing point.

"All material should be purchased with the guarantee that it contains from 70 to 75 per cent calcium chloride and before using samples should be submitted to the testing laboratory, as in the case of any other materials."

Sales Tax Refunds

In connection with the new Sales Act which goes into effect on January 1, 1924, manufacturers and wholesalers are reminded in a circular that those who desire to make application for deduction of the sales tax paid on materials on hand on the first day of January, 1924, in respect of goods which have been, are being, or are to be used in, wrought into or attached to articles to be manufactured or purchased for sale, which articles are subject to sales tax shall signify their intention of so doing in writing to the Collector of Customs on or before the 1st day of December, 1923, and shall submit an inventory in duplicate to the Collector of Customs at the port in which the business is located, not later than March 31, 1924. In connection with refunds of sales tax on returned goods, the Department of Customs announces that where goods are returned as unsatisfactory or damaged in transit and where goods of the same value are supplied in exchange, no charge being made for the goods so supplied, no tax is chargeable on the goods supplied in exchange. Where the articles supplied in exchange are of greater value, sales tax is collectable only on the difference in value.. Where the goods supplied are of less value, the amount of tax on the difference will be refunded. If the returned goods are not replaced the whole of the tax will be refunded.. In the case of goods being damaged necessitating their destruction, a refund of the tax will be made but goods to replace those destroyed will be subject to the usual tax.

No. 100

Canada's Engineers—T. Simard

Mr. T. Simard, member for Temiskaming County in the Quebec Legislature, is one of the few representatives of the technical profession in that administrative body. Mr. Simard was born at St. Joachim, near Quebec city 58 years ago. He was educated at the Quebec Seminary and Laval University where he obtained the degree of B. Sc. He was admitted to the practice of land surveying in the Province of Quebec in 1887. During the three years following, Mr. Simard was given charge of explorations and surveys of the Labrador Coast and the territory adjoining. He was the first white man to go up the long and difficult rapids of the Esquimaux River. Most of the inspections of the surveys that were done around Lake St. John were done by Mr. Simard who also laid out there, in 1894, the first base line of the district.

From 1894 to 1903 he was engaged in surveys in different parts of Quebec province, and also in the Northwest. During two years of that period he had charge of part of the survey work for the location of the Quebec and Charlevoix Railway. Since 1904 Mr. Simard devoted all his time to land, lake and mine surveys in the Temiskaming region exclusively. He is the only man possessing a complete knowledge of the conditions of that rather still unknown but rich territory included between Lake Temiskaming, the international boundary line and the Trancontinental Railway, and as far east as great Lake Victoria, and his numerous personal explorations of the gold mining country east of Larder Lake make him the only recognized authority on matters pertaining to the region. Mr. Simard was first elected member for the Quebec House in 1915 and was re-elected last February in the Quebec general elections. He is vice-president of the Corporation of Land Surveyors of Quebec Province.

Mr. T. Simard

Is Hot Water Heating Preferable?

By B. W. RANDOLPH, M. E.

The coal stringency will, to my mind, cause a marked change in the type of heating system used in large industrial plants. There is a diversity of opinion among engineers and architects on the question of heating, each type of heating, such as vapor, steam, hot air and hot water, having its advocates. My opinion, however, borne out by several experts, favors the hot water system.

The conservation of coal made possible by hot water systems, which require only enough coal to heat water to the desired temperature of the plant, has caused many industrial establishments to adopt this method of heating. Surely this method of conserving and releasing coal, as well as labor and freight for other purposes, can and should be put to use at present.

When the large industrial plants begin to realize that they can save coal by using a heating system which can be regulated in its coal use, by the temperature of the surrounding atmosphere, they will adopt it. Since 1917, the first year when prices of steam sizes of coal began their rapid upward course, I heard frequent statements of great savings from hot water systems coming from leading manufacturers. These savings claimed as high as 40% on yearly coal bills. Specific replies made to me by plant superintendents and plant engineers verify these extreme claims. A saving of 25% in fuel control is quite common. A steam heating system is only perfect at zero. Why heat water daily to the steam point, when temperature charts show that in New York, Boston, Chicago, Pittsburgh and St. Louis, that there is on the average one zero day a heating season?

Hot Water Heating is Economical

Here are a few opinions that bear out my thesis. John Gormly, past president of the American Society of Heating Engineers, says: "In a practice extending over fifty years to almost every state in the United States, my experience is that no system of heating compares with water circulation when properly installed. It is economical, silent, free from complicated devices, easy to control, offers a wide range of temperatures, is more durable, needs fewer repairs, and when properly designed may be used in the tallest buildings without excess pressure at the base. It approaches nearest to perfection so far as my experience has proved."

"Hot water heating systems," said A. W. Moulder, chief heating engineer of Grinnell Company, "will in many cases save 25% to 50% in fuel over steam systems. In the present emergency this huge saving of fuel is of great importance and eventually such savings are bound to establish hot water as the standard method of heating industrial plants. A misconception as to the high first cost of hot water systems is partly responsible for the greater use of steam. As a matter of fact, I have had experience with many large industrial plants where hot water was actually cheaper to install than the less efficient steam."

Albert Kahn of Detroit, architects and engineers of some of the largest industrial buildings in the

United States, said that economy in fuel is effected by hot water heating systems in buildings. Hot water heating systems are the most desirable in a great majority of buildings," is their statement.

James P. Dwyer Jr., engineer, of Boston, Mass., concurs in this opinion. He says: "A forced hot water heating system will be found more desirable than other types of heating systems for industrial plants. This type of system quite readily lends itself to the most unusual conditions encountered in this type of building. The quality of the heat control of same, economy of fuel and maintenance and the applicability of this type of system, easily place it in advance of other types of heating systems."

Desirable for Industrial Plants

A. M. Feldman and J. A. Almirall, constructing engineers, both of New York City, state that hot water heating systems are more desirable than others for industrial plants from the standpoint of economy of fuel, economy of labor, mildness and healthfulness, and elasticity of operation, facility of installation.

Many prominent engineers and architects agree and disagree with my conclusions,

The Week's Developments in a Nutshell

No country in the world—with the exceptions of England and the United States—could announce in the morning a bond issue amounting to $6.00 per head of population and in the evening publish the fact that it was away over subscribed. That in effect, however, is what happened in Canada on September 21. It indicates that we have money and, still better, that we have absolute confidence in Canada's future.

It has been said that such a large issue of bonds at home will tie up money and delay construction work. We believe this argument is not fundamentally sound. It is not as if it were being spent on something perishable—some luxury or other. The purchase of bonds gives the purchaser a financial backing that enables him to expand in his own special line. The bankers will support him. It gives him confidence in himself. All his creditors have confidence in him. That means commercial stability.

There is no noticeable feeling of pessimism among the captains of industry today. Writing to the Contract Record under date of September 19, Frank P. Jones, general manager of the Canada Cement Company, says, "Canada has greatly improved her position during the past year and if the government will reduce its cost of administration and reduce expenditures, the prospects are that a year from now her position will be still better."

Mr. Robert Hobson, president of the Steel Company of Canada has just returned from England. He also writes the Contract Record: "Have not got fully in touch with things yet, but what I have learned impresses me very favorably and I look for a good average fall business. We are not receiving many large individual orders but on the whole they are fairly satisfactory."

Mr. C. O. Stillman, president of the Imperial Oil, Limited, says: "No reason for discouragement or pessimism." He believes the factors that operate to retard the development of Canada are all of foreign origin and adds "conditions abroad curtail the output both of our manufactured and agricultural products. The effects of the war on emigration have produced disappointing results in our numerical growth. But for these and similar conditions we should be enjoying an era of great prosperity. As it is, our position in comparison with that of almost every other country in the world, is most satisfactory and there is no reason for discouragement or pessimism.

"As a Canadian enterprise we have shown our faith in the West by the erection of a large refinery at Calgary, which is now nearing completion and we have made no cut either in the number of our employees or in the standard of wages paid."

On this same subject of immigration Mr. Frank P. Jones makes this comment: "The great trouble with Canada today is that our population is not increasing as it should. This undoubtedly is largely caused by the fact that farm products have deflated more rapidly than other products; therefore, the farming industry has not the purchasing power it should have. Until this is rectified by a reduction in the farmer's cost of production and a reduction in the price of everything he has to buy, more particularly coal and transportation, I do not see how farming is going to be attractive enough to enable immigrants to come to this country and prosper."

Another company that thinks in optimistic terms, is the Dominion Sewer Pipe & Clay Industries, Ltd. Mr. Thomas Kennedy, vice-president of the company, writes that their production will be at least equal to and probably in excess of last year. He says "We are having a very good season; our selling prices are about the same as last year, and I am not anticipating any marked change in the near future. As a rule we have been able to secure satisfactory labor in sufficient numbers and our production will be equal to or slightly in excess of last year. I am in hopes that construction work will be carried on later this fall than last year. I would like to see the farmer getting a better return for his produce, but I do not see any reason for being pessimistic."

There have been no price changes locally, with the exception of two reductions in lath. No. 1 white pine dropped from $16.00 to $14.00; M. R. spruce from $10.00 to $9.50.

What is the Upkeep Cost of Steam Shovels?

Output and Repair Figures Applying to Machines Operating on Various Classes of Excavation—Averages for a Total of Forty-eight Shovels

Very few investigations have been made regarding the cost of steam shovel operation, particularly with a view to providing data that may be applied to steam shovels generally. What records there are have been obtained, as a rule, from the observation of the performance of one machine working under a specific set of conditions that would rarely be identically duplicated in the operation of another machine. Hence, the cost data thus obtained could hardly be applied in other cases unless the influencing factors were approximately the same. For an attempt by the Erie Steam Shovel Company to rectify this lack of information, all shovel operators will be grateful, for there have been made available by them upkeep costs and output figures based on the results of the operation in service of a very large number of machines. The data were classed according to the nature of work performed by the machines, so that the averages can fairly represent what may be expected from other machines working in the same general class of work. The figures, of course, apply to Erie shovels, but they may be taken as a criterion of steam shovel operation generally. Their importance lies in the fact that they attempt to offer a fairly dependable indication of steam shovel output and upkeep.

More than 300 records were examined by the Erie Steam Shovel Company, each being checked in complete detail and then tabulated for comparison with other records. Only those machines which had handled 200,000 cu. yds. of material or more were taken into consideration in the final analysis, as it was felt that the repair expense would then be normal. Generally speaking, repairs are very light during the first 100,000 cu. yds. of excavation. Another 100,000 cu. yds. would test the machines still further and allow them to get their proper bearing.

Obtaining Repair Costs

Each record was then checked against the repair records of the manufacturer. This brought up quite a problem. In many cases repair parts had been purchased but not used on the shovel—simply held as "spare" parts in a tool house. It was decided that these parts should be counted in, since there is no other account than repair expense that shovel owners can reasonably charge this expense to on their books. Accordingly, in all cases where parts had been ordered for a shovel and not used, the cost of these "spare" parts was added to the record if not already in the report.

The next step was to take the total repair cost—excluding spare parts on hand, but including dipper teeth, hoisting cable and grate bars—and divide this figure by the total number of cubic yards of material handled. This gave the repair cost per cubic yard.

The cost per cubic yard of consumed parts—hoisting cable, grate bars and dipper teeth—was arrived at by dividing the cost of these items by the number of cubic yards handled. The sum of these two figures gives the total upkeep cost.

Average figures for shovels handling similar work were then obtained by dividing the total upkeep and output figures by the number of machines involved in the classification. The manner in which the machines have been classified is as follows:

1. Shovels handling 75 per cent. earth—18 machines.
2. Shovels handling 73 per cent. rock, etc.—10 machines.
3. Shovels handling 74 per cent. clay—9 machines.
4. Shovels handling mixed materials—4 machines.
5. Shovels handling 69 per cent. sand and gravel excavation—7 machines.
6. Shovels handling all kinds of work—48 machines.

Shovels Handling 75 Per Cent. Earth

These figures apply to 18 Erie shovels which have worked a total of 16,350 days and handled a combined output of 6,320,636 cu. yds. This yardage classifies as 75 per cent. earth, including both wet and dry excavation; 14 per cent. rock, hardpan, concrete, glass slag, and frost; 11 per cent. of shale, clay, sand, gravel and coal. Figures for all of the 18 shovels were lumped and then divided by 18 in order to obtain averages, with the following results:

Average material handled per shovel	351,147 cu. yds.
Average number of days worked per shovel..	908
Average output per day per shovel	387 cu. yds.

The average daily output of 387 cu. yds. includes 290 cu. yds. of earth, 55 cu. yds. of rock and similar hard material, and 42 cu. yds. of shale, coal, stiff clay, sand and gravel, etc.

The cost of consumed parts—hoisting cable, grate bars and dipper teeth—is as follows:

	Per cu. yd.	Per working day.
Hoisting cable per shovel	.027c	8.19c
Dipper teeth per shovel	.030c	11.74c
Grate bars per shovel	.005c	1.98c

Actual upkeep, which includes the cost of all repair parts except hoisting cable, dipper teeth and grate bars is shown in the following table, which also shows the cost of the consumed parts and the total upkeep cost per shovel (which includes actual repairs, plus hoisting cable, dipper teeth and grate bars):

	Per cu. yd.	Per working day.
Actual upkeep cost per shovel	.093c	35.99c
Consumed parts	.062c	21.91c
Total upkeep cost per shovel	.155c	57.90c

Shovels Handling 73 Per Cent. Rock, etc.

This summary covers the records obtained from the operation of 10 Erie shovels which worked a total of 8,910 days and moved 3,165,186 cu. yds. of material classified as 73 per cent. rock, frost, hardpan and macadam. The following average figures applied to the machines in this group:

Average material handled per shovel	316,519 cu. yds.
Average number of days worked per shovel	891
Average output per day per shovel	355 cu. yds.

Of this average daily output 174 yds. were classed as rock, 64 yds. as hardpan and frost, 21 yds. as macadam, 14 yds. as shale and stiff clay, 7 yds. as coal and 75 yds. as earth or cinders, sand and gravel, etc.

Average Cost of Consumed Parts

	Per cu. yd.	Per working day.
Hoisting cable per shovel	.018c	6.43c
Dipper teeth per shovel	.062c	21.78c
Grate bars per shovel	.004c	1.57c

Average Cost of Upkeep

Actual upkeep cost per shovel	.156c	55.36c
Consumed parts	.084c	29.78c
Total upkeep per shovel	.240c	85.14c

Shovels Handling 74 Per Cent. Clay

Nine shovels were involved in this classification. They worked a total of 5,419 days, handling 2,390,207 cu. yds. The following figures were the average records:

Average material handled per shovel	265,578 cu. yds.
Average number of days worked per shovel	602
Average output per day per shovel	441 cu. yds.

Classified as 327 cu. yds. of clay; 39 cu. yds. of rock, hardpan and frost; 31 cu. yds. of coal and shale; and 44 cu. yds. of earth, sand and gravel.

Average Cost of Consumed Parts

	Per cu. yd.	Per working day.
Hoisting cable per shovel	.015c	7.75c
Dipper teeth per shovel	.048c	21.32c
Grate bars per shovel	.005c	2.10c

Average Cost of Upkeep

Actual upkeep cost per shovel	.087c	38.24c
Consumed parts	.068c	31.17c
Total upkeep per shovel	.155c	69.41c

Shovels Handling Mixed Materials

The four shovels in this group handled 1,056,200 cu. yds. of material in 2,320 working days. This digging was largely in mixed earth and rock, rock and shale, earth and shale, etc., etc., so combined that the records are not to be classed with any of the group summaries.

Average Record of Four Shovels

Average material handled per shovel	264,050 cu. yds.
Average number of days worked per shovel	580
Average output per day per shovel	455 cu. yds.

Average Cost of Upkeep

	Per cu. yd.	Per working day.
Actual upkeep cost per shovel	.113c	51.39c
Consumed parts	.045c	21.88c
Total upkeep cost per shovel	.158c	73.27c

Shovels Handling 69 Per Cent. Sand and Gravel

The averages for this group were obtained from the records of 7 shovels that moved a total of 2,049,203 cu. yds. in 4,866 working days. This material was classified as 69 per cent. sand and gravel, 8 per cent. rock, shale and concrete, and 23 per cent. earth, coal, clay, etc.

Average Record of 7 Shovels

Average material handled per shovel	292,744 cu. yds.
Average number of days worked per shovel	695
Average output per day per shovel	421 cu. yds.

Average Cost of Consumed Parts

	Per cu. yd.	Per working day.
Hoisting cable per shovel	.013c	5.50c
Dipper teeth per shovel	.014c	5.75c
Grate bars per shovel	.003c	1.04c

Average Cost of Upkeep

	Per cu. yd.	Per working day.
Actual upkeep cost per shovel	.087c	36.56c
Consumed parts	.030c	12.29c
Total upkeep cost per shovel	.117c	48.85c

Shovels Handling All Kinds of Work

To obtain the average for this general summary, the yardages and upkeep costs of the 48 shovels involved in the previous classifications were totalled and divided by 48. These 48 shovels worked altogether 37,865 days and handled a total yardage of 14,981,432 cu. yds. classified as 40 per cent. earth, wet and dry excavations; 26 per cent. rock, concrete, frost, macadam, hardpan and slag; 17 per cent. clay and shale; 14 per cent. sand and gravel, and 3 per cent. coal.

Average Record of 48 Shovels

Average material handled per shovel	312,113 cu. yds.
Average number of days worked per shovel	789
Average output per day per shovel	396 cu. yds.

Average Cost of Consumed Parts

	Per cu. yd.	Per working day.
Hoisting cable per shovel	.020c	7.53c
Dipper teeth per shovel	.037c	14.42c
Grate bars per shovel	.005c	1.86c

Average Cost of Upkeep

Actual upkeep cost per shovel	.106c	41.89c
Consumed parts	.062c	23.81c
Total upkeep cost per shovel	.168c	65.70c

These are average figures for 48 shovels of all kinds, working under various conditions. Some of the machines were kept up in splendid shape; others were buried under water, exposed to blasts or otherwise abused. Some of these shovels were only about 2 years old; others were 7 or 8 years old—the average age was 44 1/3 months.

Equating for Difference in Materials

When the Erie Steam Shovel Co. started to make this study, some basis for comparison had to be arrived at. It is very plain, for example, that it would not be fair to place a steam shovel that had handled 300,000 cu. ft. of rock. or hard-pan on the same basis with a machine which had handled 300,000 cu. yds. of earth or sand. Accordingly, computations were made to find the correct factor which should be used in each case to equate the cost per cubic yard according to the class of material handled.

In the case of the above figures, it was unnecessary to make any adjustment since the records are grouped according to the class of work handled. The upkeep costs are therefore actual unequated costs. Where comparisons are to be made, however, between machines handling differing types of excavation, then some equalizing factor must be used.

For this purpose, 15 records of steam shovels which had handled 90 per cent. rock were grouped and compared with 15 shovels which handled 90 percent earth or sand. The average of these two groups showed that the repair cost per cubic yard was almost exactly twice as much in the case of the machine handling hard-pan or rock. This was, therefore, used as the basis for equating the average cost according to the class of material handled. By means of a divisor, the actual cost per cubic yard was modified as required, the divisor increasing with the proportion of hard materials handled. In the case of earth the divisor was 1.0; for rock the divisor was 2.0. Between these two extremes the divisors were arbitrarily established according to the class of material. For clay, the figure of 1.3 was used and for shale, 1.6. In most cases the steam shovel handled several different kinds of material and the equating divisor was, therefore, shifted in accordance with the amount of materials in each classification. For example, if a steam shovel had handled 200,000 cu. yds. of rock and 100,000 cu. yds. of earth, the divisor used was 1.7. By dividing this equating figure into the flat cost per cu. yd., an equated cost per cu. yd. was determined, which put the machines on the same basis for comparison.

As an example of how this works, the operation of a shovel belonging to the Dufferin Construction Co., Toronto, may be taken. This particular shovel in five and a half years moved 430,000 cu.yds., including 131,000 cu. yds. of rock, 244,500 cu. yds. of earth, 23,500 cu. yds. of frost, 19,000 cu. yds. of hard-pan and 12,000 cu. yds. of shale. The upkeep cost per cu. yd. was .38 cents. Equated in the manner described above, this upkeep cost was reduced to .27 cents on an earth basis. By using this latter figure, it was then possible to make reasonably dependable comparisons between this shovel and any other, even though the class of work handled was somewhat different.

While the age of the shovel and the amount of excavation it has done have an important bearing on upkeep cost, there has not yet been devised any method of equating for this factor. Another important item in repair expenses is the travelling that the shovel does under its own power. Travelling from one location to another is often very hard on the shovel and has an important influence on its life. However, as in the case of the age of the shovel, it has not yet been even practicable to devise any scheme for equating for the amount of travelling. Comparisons between steam shovel output and upkeep costs must therefore be made without regard to either the age of the machine or the amount of travelling it has done under its own power.

Haunched Steel Beams Superior to Concrete Beams Reinforced by Rods

Tests Demonstrate that in Steel Joists Encased in Concrete the Flange Stress is Very Materially Reduced—Several Advantages Over Reinforced Concrete Beams

Tests conducted a few months ago at the instance of the Steel Branch of the Canadian Manufacturers' Association indicated that when steel beams are haunched with concrete the two materials act together to form a composite beam, with the result that the flange stresses and deflections are considerably less than the corresponding figures calculated on the assumption that the steel acts independently of the concrete. In current practice steel joints encased in concrete and supporting reinforced concrete floor slabs are designed to take the entire load, including the weight of the concrete with a flange stress not exceeding 16,000 lbs. per sq. in. Since the tests referred to have demonstrated that the action of the concrete is to reduce the flange stress, considerable economy in the support of live loads may be obtained by utilizing the joint action of the concrete and steel. A few figures from the report of the testing engineers will explain the nature of this action:

	Flange	Stress—Lbs. Per Sq. in.	
Total dead & live load lbs. per sq. ft.	Calculated for steel only	Observed	Per cent. Observed of Calculated
186.7	15,780	9,960	63.2
241.7	20,430	12,255	59.8
296.7	25,080	14,800	59.1
352.1	29,760	16,780	56.5
384.8	32,520	18,110	55.8
414.6	34,040	19,595	56.0
446.6	37,760	21,885	58.0

From these and other experimental results, the engineers whose report is referred to at greater length in the Contract Record of January 24, 1923, page 66, are enabled to draw the conclusion that haunched steel beams have load carrying capacity considerably in excess of that of steel beams alone as permitted by current designing practice.

The fact that haunched steel beams thus have increased load capacity leads to their comparison with concrete beams reinforced with rods and in this connection the engineers who conducted the tests referred to cite these advantages for haunched steel beams:

1. The certainty of the position of steel in relation to the concrete which ensures proper distribution of stress and the prescribed thickness of protection of steel against fire.

2. Continuous steel web to resist shear and transfer longitudinal shear from the steel tension fibres into the concrete compression areas.

3. The construction is independent of the adhesion of concrete to steel in the areas in which the concrete is strained in tension, and thereby avoids having to rely on the adhesion of the steel to concrete which has partially failed.

4. Reduction of the hair cracks in the concrete tension flanges owing to the smaller fibre stress in the concrete due to the dead load being wholly supported by the steel.

5. Alterations can be made without destroying the strength of the beams.

6. The safety of buildings during the setting of the concrete is independent of the temporary shoring and the forms can be removed before the concrete is cured without danger of collapse to the main structure.

7. In the event of the absolute failure of a batch of concrete, the steel construction alone will support the figured load within a factor of safety of two, and the elastic limit of the metal.

Powerful Steam Shovel

A steam shovel which weighs, with coal, 300 tons, has been built in England for irrigation work in the Punjab, India. It is ten times the size of those usually employed in such work.

The "Contract Record and Engineering Review" is a member of the Audit Bureau of Circulations.

What Effect has Cement Content on Concrete?

Experiments Conducted in England with the Object of Determining the Relation Between Strength and the Proportion of Cement —Tests on Variation of Volume

At a recent meeting of the Institution of Structural Engineers Dr. Oscar Faber, O.B.E., D.Sc., read a paper on "Experiments on Concrete of Different Cement Contents."

The paper was divided into Parts I, II, and III, from which the following extracts are taken.

PART I.

In connection with some work requiring rich concrete, the lecturer some time ago wanted definite experimental results as to how the properties of concrete were affected by varying the cement contents, and could find only isolated and unrelated tests, which, moreover, agreed but poorly with one another. He therefore determined to make a thorough and careful series of tests, in which cubes were made with 10 per cent., 20 per cent., 30 per cent., etc., up to 100 per cent. of cement, with careful measurements of weights of all the ingredients sufficient to furnish data as to weight of concrete, shrinkage of materials, quantities of material required, crushing strength, etc.

Such a series was made in August and September, 1922, and the quantity of water was left to the operator to find by trial, the resultant wetness to be controlled by a slump-test so as to obtain uniform wetness with all mixtures. It was found, however, that in spite of considerable care the results were very variable and bore strong internal evidence of unreliability, which was traced to variations in water content, which, of course, has a predominatory effect on strength of concrete. In other words, it was not found practicable, by means of leaving it to the discretion of the operator, assisted (or perhaps hampered) by a slump-test machine, to get the water contents sufficiently uniform in the various tests to obtain really uniformly varying results having strong internal evidence of reliability and consistency.

A second series was therefore undertaken, in which the water content of each mixture was carefully regulated, according to a formula which had been designed to give uniform wetness to both rich and poor mixtures. Even though it was subsequently found that this formula could be improved on slightly, the second series did produce the instructive and reliable results hoped for.

In order to obtain really accurate proportions of cement, sand, and ballast it was found necessary to measure these by weight and not by volume, and it may be pointed out that the same cement can give variations in volume corresponding to a variation of from 90 to 60 lb. a cu. ft., depending solely on whether it be loosely packed or consolidated, and that a given measure filled with cement from a sack will give widely varying weights, and that clearly under such conditions no consistent results could be anticipated if the quantities were measured by volume. The same argument applies to sand and ballast, but to a much smaller extent.

In this series of experiments the ratio of sand to ballast was kept as 1 to 2 throughout all the mixtures. The sand used was washed Ham River grit (a clean siliceous sand), and 3/4-in. crushed Ham River ballast.

Throughout the tests a 10 per cent. cement content means that the weight of cement shall be 10 per cent. of the total weight of dry materials (cement, sand, and ballast); from which it follows that the sand and ballast would be 90 per cent., and since

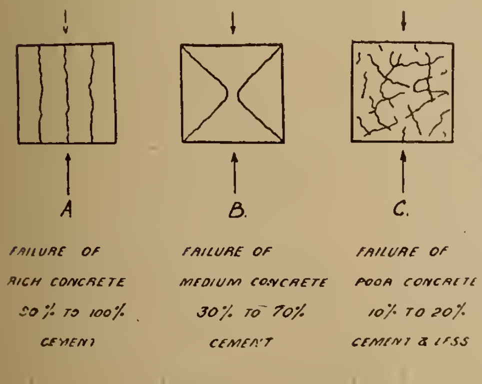


Fig. 1 (above)—How method of failure was affected by richness of mixture.

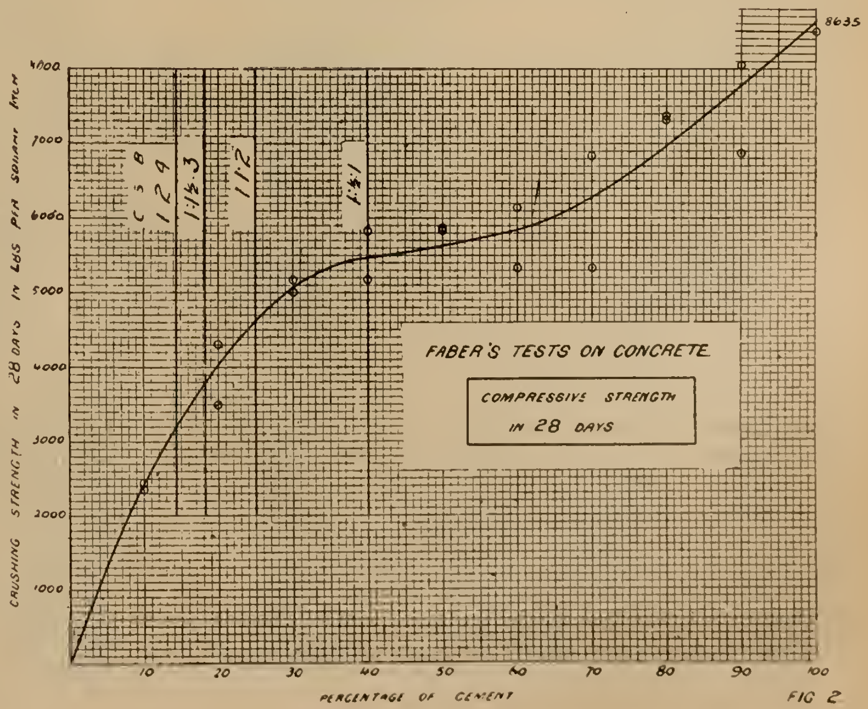


FIG 2

Fig. 2 (right)—Relation of strength to proportion of cement.

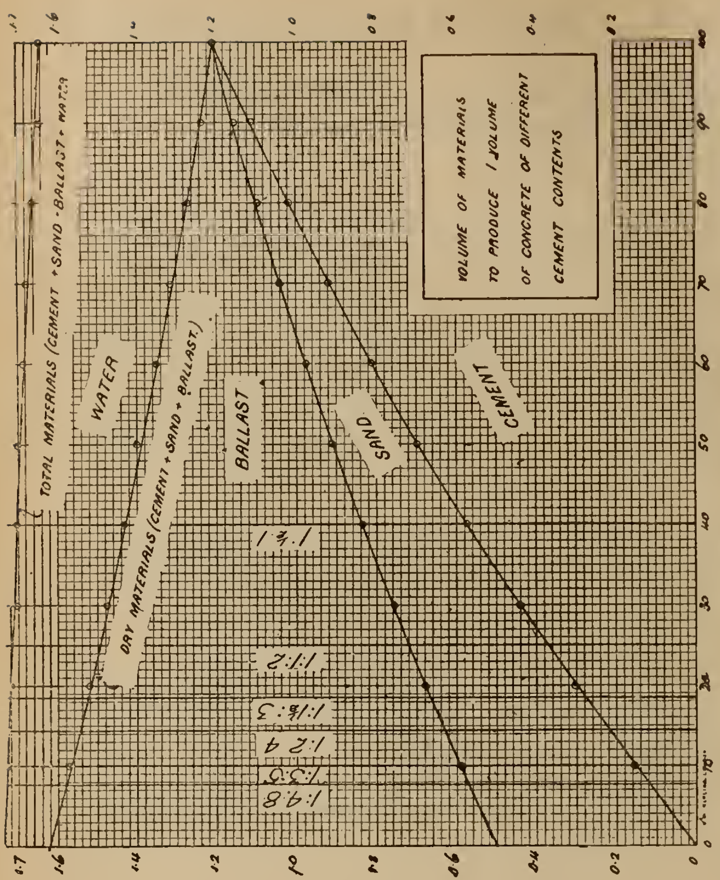
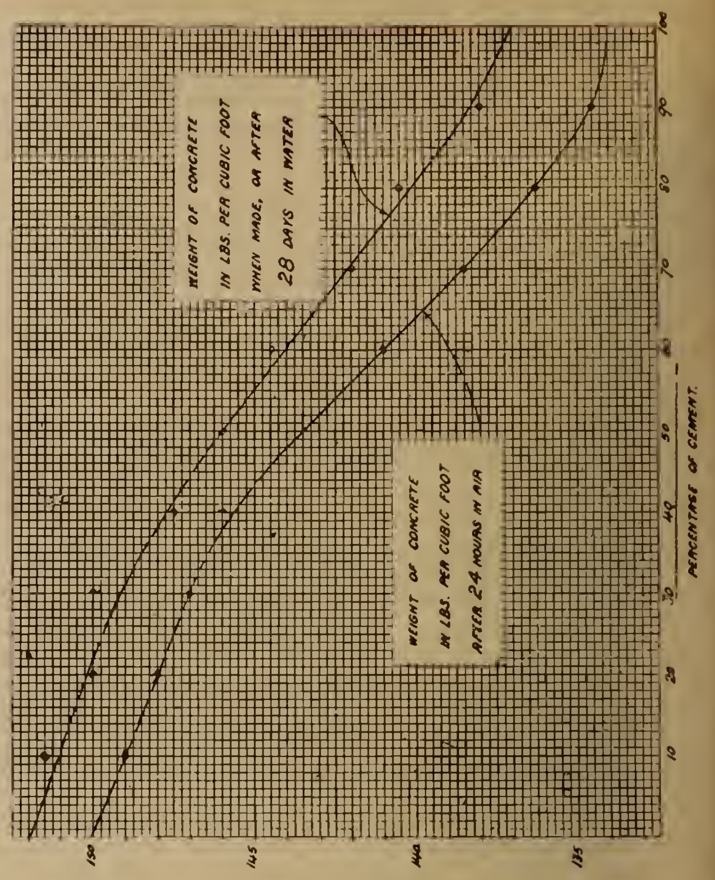


FIG. 5



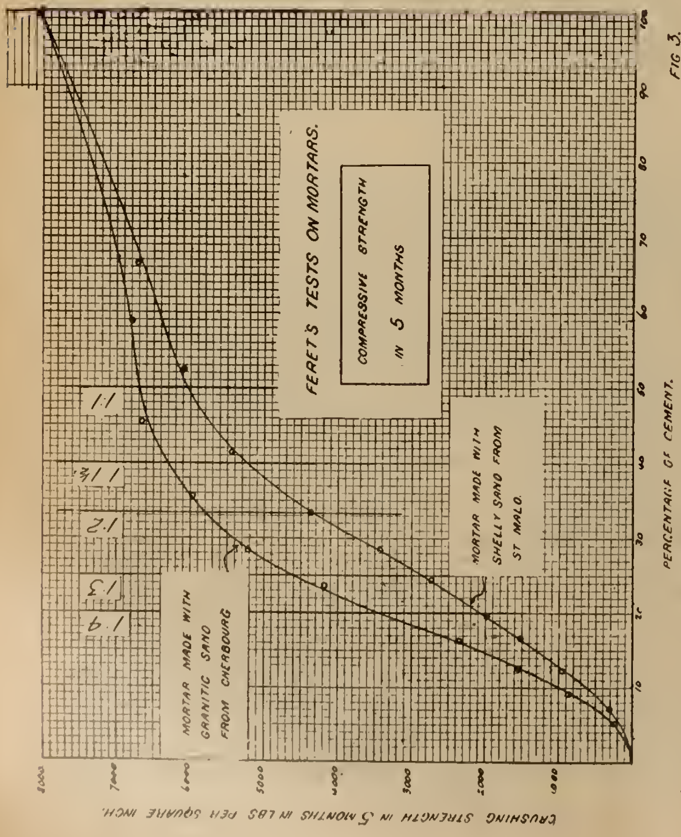


FIG 3.

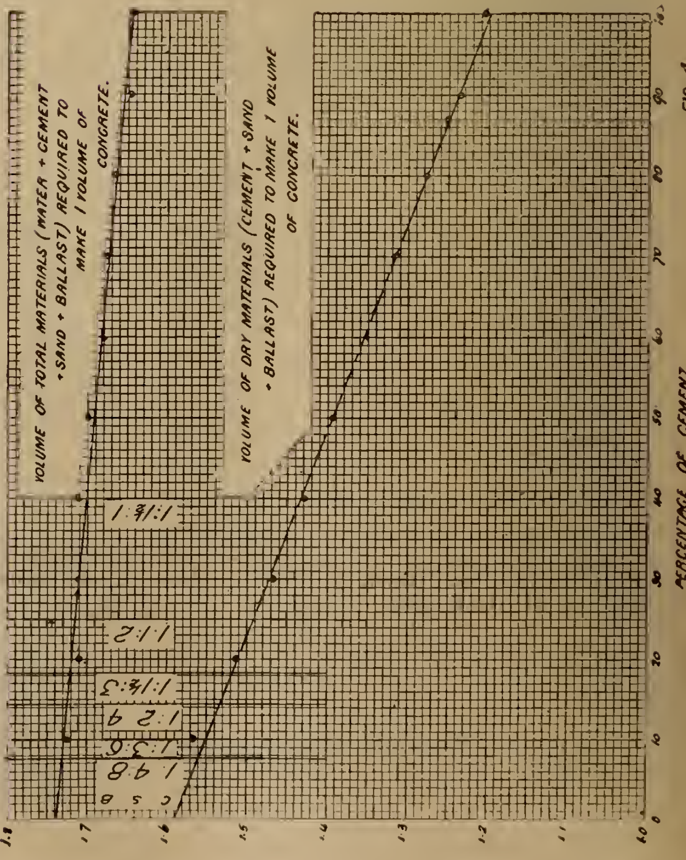


FIG. 4.

the sand is to be half the ballast, the sand would be 30 per cent., and the ballast 60 per cent., of the total weight of dry materials.

The cement percentage might have been taken as the percentage of the weight of all materials (cement, sand, ballast, and water), but this would conform less to usual parlance of the industry.

The water content was calculated by taking 25 per cent. by weight of the cement plus 5 per cent. by weight of sand and ballast. It was found that this formula made the very rich specimens rather too dry and the very poor ones rather too wet, and that a better formula is 28 per cent. by weight of cement plus 4 per cent. by weight of sand and ballast.

Subsequent tests were made verifying that this did in fact give proper and uniform consistency to all mixtures, but the formula first given was used in the tests here described.

The cement was of good quality British manufacture.

Conduct of Tests

The proportions of cement, sand, and ballast were calculated so as to give 5,000 gms. of dry materials in all cases, the cement contents being 10 per cent., 20 per cent., 30 per cent., etc., up to 100 per cent. in the various tests the remainder being divided between the sand and ballast in the proportions of 1 to 2.

These materials were weighed out, mixed, and the water calculated by the formula given was measured out and added.

Two cast-iron 4-in. cube moulds were filled with concrete, and the remainder of the concrete carefully kept.

After keeping for 24 hours in air the cubes and residue were weighed, and the cubes then kept in water for 28 days, when they were crushed.

The temperature during mixing did not vary outside the limits of 58 deg. to 61 deg. Fahr., and all the materials had been kept in the laboratory to acquire its temperature. The specimens were also kept approximately at this temperature when hardening in water.

The cubes were crushed in an "Amsler" machine. In most cases timber packing was used. The tests marked with an asterisk gave low results owing to a knot in the timber. The average in the curves has taken cognizance of this in giving these tests less importance. The five poorer specimens were crushed without packing.

It was very marked that the richness of the concrete affected not only the strength but the method of failure. The richest specimens (100 per cent. and 90 per cent. cement) failed by splitting vertically. The medium ones (70 per cent. and 30 per cent. cement)gave the usual conical failure, while the poor ones (10 per cent. and 20 per cent. cement and less) failed by irregular crushing. These are illustrated in Fig. 1.

Fig. 2 shows the relationship between the percentage of cement and the crushing strength of the cubes. This curve is one of the greatest importance and brings out many interesting points.

It will be noticed that the positions on the curve corresponding to 1:2:4 and 1:1:2 mortars are indicated so that the relative strength of these and other similar proportions can readily be ascertained.

The crushing strength of 1:2:4 concrete from the curve is 3,150 lb. per sq. in., and that of the 1:1:2 concrete is 4,600 lb. per sq. in. It will be noticed that this is almost exactly 50 per cent. greater than the 1:2:4. This is a matter of considerable interest and has some bearing on the L.C.C. Regulations, which allow 600 lb. per sq. in. for 1:2:4 concrete and 750 lb. per sq. in. for 1:1:2 concrete. In other words, they only allow a 25 per cent. increase in stress against the 50 per cent. increase in stress actually ascertained by the experiments.

Fig. 2 also brings out the interesting fact that between 40 per cent. of cement and 70 per cent. of cement there is only a very small increase in strength. After that, however, the increase in strength with additional cement contents again becomes appreciable. This is a very interesting fact, and can readily be understood if the strength of the concrete is considered in terms of its tensile strength across vertical or oblique planes. It is of interest to note that the curve between compressive strength and cement contents has quite a different shape for concrete from its shape with cement mortars.

Fig. 3 gives the corresponding curves drawn from results published by R. Feret in 1897. It will be seen that the curvature in the case of the mortar curves is quite different, and a comparison of the two is of considerable interest.

Perhaps the next interesting fact emerging from these experiments is in connection with the shrinkage —that is to say, the reduction in volume of the dry materials which takes place when they are mixed together and wetted to form concrete. To ascertain this, not only were the materials actually weighed as mentioned and the volume of the concrete in the cubes ascertained, but the residue of concrete left over when the cubes had been made was also carefully measured, so that the total quantity of concrete produced from a given quantity of material was definitely ascertained. This shrinkage is, of course, of enormous importance to contractors, because from it can be calculated how much cement and materials are required to produce a cubic yard of concrete.

The shrinkage rises consistently with the richness of the mixture from about 18 for neat cement to about 36 for a 10 per cent. mixture. In other words, 100 parts of dry material were required to produce 64 parts of concrete, or that 100÷64=1.56 cu. yds. of dry material are required to produce 1 cu. yd. of concrete of this particular richness. Of this 1.56 cu. yds. the cement would represent, roughly speaking, 0.16 cu. yds., leaving about 1.4 cu. yds. to represent volume of sand plus volume of ballast measured separately.

Generally speaking, the result of these tests confirms those of many other previous tests, which all go to show that the amount of shrinkage is generally greatly underestimated by contractors when estimating for concrete.

In the calculation of these shrinkages cement was taken as weighing 90 lb. per cu. ft. In practice it may actually weigh less, depending on its condition, and in such cases the shrinkage would actually be greater. Figs. 4 and 5 show the relationship between the volumes of cement, sand, ballast, and water, and the volume of dry materials and total materials, and should be of considerable assistance to contractors in estimating.

Fig. 6 gives the weight of concrete in lb. per cu. ft. for the different mixtures at different periods, from which it will be seen that the weight per cu. ft. in-

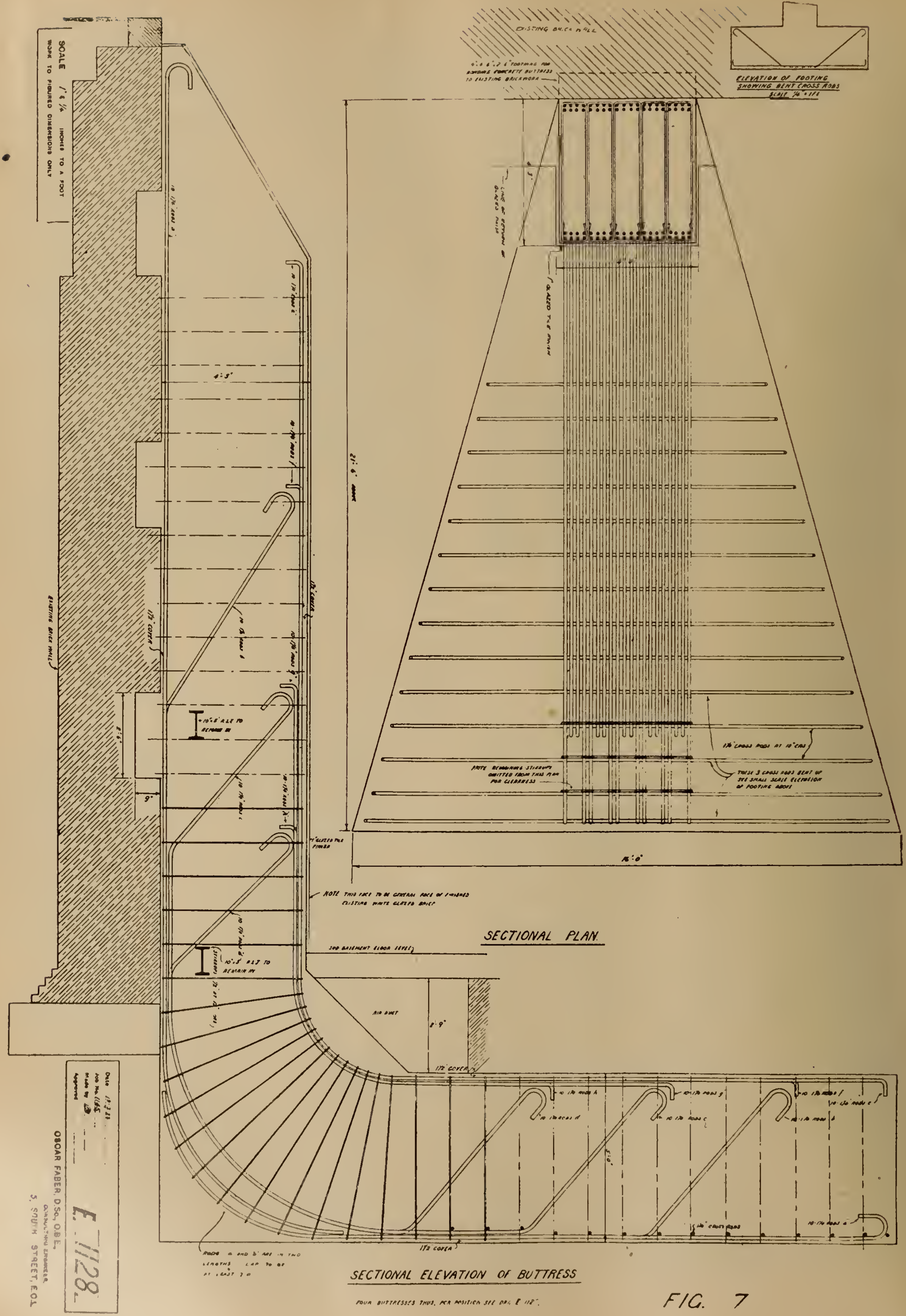

SCALE 1/4 & 1/2 INCHES TO A FOOT
WORK TO FIGURED DIMENSIONS ONLY
EXISTING BRICK WALL
ELEVATION OF FOOTING SHOWING BENT CROSS RODS
SCALE 1/4 = 1 FT
21' 6"
4' 3"
9"
15' 0"
2' 9"
5' 0"
1 1/2 COVER
1 1/2 COVER
1 1/2 COVER
NOTE REMAINING STIRRUPS OMITTED FROM THIS PLAN FOR CLEARNESS
1 1/2 CROSS RODS AT 10" CRS
THESE 3 CROSS RODS BENT UP SEE SMALL SCALE ELEVATION OF FOOTING ABOVE
NOTE THIS FACE TO BE GENERAL FACE OF FINISHED EXISTING WHITE GLAZED BRICK
SUB BASEMENT FLOOR LEVEL
AIR DUCT
SECTIONAL PLAN
SECTIONAL ELEVATION OF BUTTRESS
FOUR BUTTRESSES THUS, FOR POSITION SEE DRG. E 1118.
OSCAR FABER, D.Sc., O.B.E.,
CONSULTING ENGINEER,
5, SOUTH STREET, E.C.2.
E. 1128.

FIG. 7

creases as the cement content is reduced. These results also show that the cubes lost about 3 per cent. of water by evaporation in the first 24 hours, and reabsorbed about the same amount in the subsequent 28 days under water.

It is found that the safe stress for a 1:2 concrete works out to 3,150÷4, which is nearly 787 lb. per sq. in. This is, of course, considerably higher than the present L.C.C. allowance of 600, and it would appear that the figure of 750 lb. per sq. in. which the lecturer had for some time been urging the L.C.C. to adopt in the revised Regulations is fully justified by the experiments.

As a matter of interest in passing, the corresponding safe stress to give a factor of safety of 4 for the 1:1:2 concrete comes to 4,600÷4=1,150 lb. per sq.in. Naturally, he would only use these stresses when the materials were equal to those used in the tests.

In the experiments just described the lecturer expresses his indebtedness to Mr. H. T. Desch and Mr. Derek Hannen, who co-operated with him in conducting the tests and provided the necessary facilities, and whose interest aided materially in securing such accurate and consistent results.

PART II.

Experiments on the Variations of Volume in Proportioning Concrete

Engineers, architects, and contractors have been in the habit of specifying concrete to be apportioned by volume. For example, a common specification is 4 parts ballast, 2 parts sand, and 1 part of cement, all measured by volume. To this custom there are grave objections, owing to the fact that a cu. ft. of cement may represent anything between 60 and 90 lb., depending on the extent to which it is consolidated, or to which, on the other hand, air has been occluded between the cement particles, and in the same way, but to a much lesser extent, the amount of sand in a given volume varies with its wetness and its degree of consolidation.

He was aware of this discrepancy, but it was Mr. Desch who first opened his eyes to the extent of the variations, which he had never realized were so great as they are, and it was with a view to ascertaining this in a different manner that experiments were put in hand to show how much a given volume of cement and sand could vary in weight under different conditions. The actual cement used in the previous experiments was found to weigh 1432 grams per litre when put in the litre pot and shaken until it was thoroughly consolidated. As 1,445 grams per litre corresponds to 90 lb. per cu. ft., it will be seen that this was a common figure.

The cement was then filled into the litre pot by allowing it to trickle in from a vessel held some distance above it through a very small orifice, so that the cement dropped in a thin stream through the air and settled in the litre pot without any shaking. When it had filled the pot and some distance above it, the excess over the top of the pot was cut off with a trowel and the contents were weighed. The weights in two separate experiments were 955 grams and 950 grams respectively per litre. This corresponds to about 60 lb. per cu. ft., and represents only two-thirds of the previous weight. For this particular cement the two figures of 90 lb. per cu. ft. and 60 lb. per cu. ft. represented the maximum and minimum weights of the cement which could be obtained by variations in compaction obtained by shaking.

It was thought to be interesting to see what actual weights would be obtained by scooping the cement with an ordinary cement scoop direct from the barrel and filling the litre pot without any shaking. The results of four consecutive experiments were as follows:

1,105 grams per litre
1,206 " "
1,074 " "
1,079 " "

These results lie intermediate between the maximum and minimum values previously recorded, and lie rather below than above the mean, and correspond roughly to about 70 lb. per cu. ft.

The significance of these variations is, of course, as follows:—The proportions by volume for concrete are generally based on cement weighing 90 lb. per cu. ft., but actually the cement may weigh as little as 60 lb. after it has been sufficiently disturbed and is poured into the cement measure as loosely as possible. In such cases the engineer thinks he is getting 6 to 1 mixture on the basis of 90 lb. per cu. ft., when actually he would only be getting a 9 to 1 mixture on that basis, and in practice would actually get something which would lie intermediate between the two values.

When the cement is loaded into barrels or sacks at the works its weight per cu. ft. approximates to 70, and its transit by rail and carrier has the effect of consolidating it, so that it frequently weighs about 90 lb. per cu. ft. when it arrives at its destination. What it would weigh in the actual measure on the banker board would depend entirely on the way in which it is filled into such measure, whether it is shaken or filled loosely. It is clearly most unsatisfactory that variations of this magnitude up to 33 per cent. in the cement contents can occur, and this is equally unsatisfactory from the engineer's or architect's point of view as well as that of the conscientious contractor, and to obviate this difficulty the lecturer considers it very much better to specify concrete as follows:

.. cu. ft of ballast.
.. cu. ft. of sand.
1 bag of cement containing not less than 200 lb.

Experiments were made to see to what extent the same variations occurred in the case of sand and ballast. It was realized, of course, that they would be much less, but it was desirable, nevertheless to ascertain their actual values.

PART III.

The lecturer was recently called in to advise in connection with some retaining walls. A large site had been excavated to a depth of 30 ft. approximately, and the surrounding earth, together with the buildings upon it, were being retained by means of a brick wall 3 ft. in thickness. At the time when he was called in the wall was showing signs of overturning owing to the pressure of earth behind it. It was immediately shored to render it safe, and subsequently strengthened as described.

In connection with this work the lecturer formed the opinion, after an examination of the soil, that the pressure on the back of the wall might safely be calculated at a pressure of $p=30\ (h+6)$, where "p" is the horizontal pressure in lb. per sq. ft. and "h" is the depth in ft. from the top of the soil. The effect of the buildings behind the wall could be allowed for by an equivalent sur-charge of 6 ft. of earth.

On this basis the horizontal pressure at the top of the wall would amount to 180 lb. per sq. ft., and that at a depth of 30 ft. to 1,080 lb. per sq. ft. It was desired, for several reasons, to have a check of these pressures if possible, and it was found that the trench for the retaining wall was strutted across by means of horizontal timber struts 7 ft. apart in both directions, the sectional area of the struts varying between 7 in. sq. and 6 in. sq.

This, of course, was on the portions of the wall where the dumpling had not been removed, and where the struts were still resisting the full horizontal pressure corresponding to their particular depth. It was noticed that the struts had indented themselves to a considerable distance into the horizontal timber walings, and this suggested the means of checking the earth pressure. A particular strut halfway down the wall was found to be 7½ in. sq., and the indention to the horizontal timber, which amounted to about 3/8 in., was measured. A similar strut and a similar piece of waling were then tested in a testing machine and it was found that a pressure of about 28,000 lb. was required to produce the same indention of the strut into the waling.

Having regard to the fact that these struts were 7 ft. apart in both directions, it was possible to check back, and calculate that the earth pressure of the depth must be of the order of 28,000÷49=570 lb. per sq. ft. The calculated pressure curve comes to 630 lbs per sq. ft., which was considered to be in close agreement.

This was considered of sufficient interest to be recorded, because it is not often engineers have opportunities of checking the pressures for which retaining walls need to be designed.

As a matter of interest Fig. 7 is added, showing how the walls were actually strengthened. A reinforced concrete buttress of rather peculiar design was constructed against the inside of the wall at intervals and efficiently bolted to the existing brick walls. Its effect is to increase the leverage of the weight of the wall from about 1 ft. to about 15 ft., and is therefore obviously extremely effective in supporting the wall against any tendency to overturn. It will readily be appreciated how extremely economical this method of strengthening the wall was as compared, for example, with the construction of a continuous reinforced concrete wall inside the brick one, which would have been the only practicable alternative which would have given adequate strength to resist the pressures which actually were found to exist.

From a point of view of obstruction, the arrangement adopted also proved to be peculiarly convenient, as these buttresses could be placed in certain recesses in the brick wall. It will be noticed that the buttresses are very heavily reinforced, as might be expected, as the pressure on a considerable width of wall was being resisted by a buttress only 4 ft. wide, and it was necessary to reduce the dimensions to an absolute minimum, with a view to causing as little obstruction as possible.

The value of the Canadian National Exhibition plant is placed at $11,000,000, made up of $6,000,000 in buildings and $5,000,000 in grounds.

Hot Water Supply and Sludge Disposal

By **ARTHUR J. MARTIN, M. Inst., C. E., F. G. S.***

The connection between these two subjects is not apparent at first sight, but I propose to show that one has an important bearing upon the other.

Hot Water Supply

The question of communal heating and hot water supply has attracted a good deal of attention during the past few years, and has formed the subject of at least three discussions at the Royal Sanitary Institute. There is a prevalent impression that the national housing schemes now on foot afford an exceptional opportunity for schemes of the kind, though there is probably no class of property in connection with which the conditions are so unpromising.

It is agreed on all hands that a general supply of hot water is eminently desirable, and that such a supply would do much to lighten the work of the housewife. It is recognized, however, by all who have any experience in such matters that the distribution of hot water, especially to houses scattered over a large area, presents great difficulties, and would in any case be a very costly matter.

It is not generally realized how difficult it is to carry hot water or steam to any distance without a very serious loss of heat, nor how expensive a matter it is to lay and insulate the mains in such a way as to prevent the heat losses from becoming absolutely ruinous. The need for frequent expansion joints, and their liability to leak, is often lost sight of. With the best of insulation the loss of heat from a long main must be considerable. Further cooling will occur in the domestic pipe system. Unless, therefore, the water is drawn at short intervals, it will always run cool at first; and much water will be wasted before it comes at the desired temperature.

In addition to these unavoidable losses, there is a psychological element which must not be lost sight of. When hot water can be got by merely turning a tap, people are apt to forget that it costs money to heat that water; or, if they do remember it, they may consider it a point of honour to get their full share—or a bit more. With all these adverse factors to contend with, it will be seen that the provision of an unrestricted supply of hot water is a somewhat hazardous undertaking.

Sludge Disposal

Here again we start with a general agreement. The disposal of sludge is undoubtedly the chief difficulty in connection with sewage disposal. Great improvements have been made of late years in the methods of purifying sewage; but they have done little or nothing towards solving the problem of sludge disposal. The latest developments indeed have rather intensified the difficulty than otherwise.

It is not as if the sludge had no value. Mr. J. D. Watson, in his paper on "Utilization of Sewage Sludge," which he read at the Folkestone Congress of the Royal Sanitary Institute in 1921, enumerated no less than six ways in which sludge or some of its constituents had been utilized. "If it is possible to utilize sludge profitably," he said, "then that also is a duty; but it is a duty for the most part which remains unfulfilled."

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*Extract from paper presented to the Engineering and Architecture Setcion of the Royal Sanitary Institute Congress.

There are just a few honourable exceptions. Bradford, Huddersfield and Morley are extracting and selling the grease from their sludge. Many other towns air-dry or press their sludge and sell it for use as manure. In the vast majority of cases, however, the sludge is dumped on land or at sea without any attempt to utilize it.

There are various reasons why the duty which Mr. Watson has indicated remains unfulfilled. Not the least of these is the difficulty of finding a market for the sludge, or for the constituents which might be recovered from it.

Sludge possesses, however, one element of value in connection with which this difficulty does not arise. It contains a respectable amount of combustible matter. Samples of Birmingham sludge dried at 212 deg. Fahr. gave calorific values of 4,120 and 4,893 B.T.U. respectively, or one-third of that of coal. Herr Elsner, in his "Treatment and Utilization of Sludge," states that briquettes made from de-watered Frankfort sludge, air-dried to 10 per cent. of moisture, gave an effective calorific value of 2,500 calories per kilogramme (4,500 B.T.U. per lb.) (Allen's "Sewage Sludge," p. 92.)

Sludge as it leaves the tanks contains always a very large proportion of water, often 90 per cent., or more. In this state it will not burn; but it will do so readily if its water-content is reduced by air-drying. During the coal strike of 1912, and again in 1920, a large quantity of air-dried sludge was used to supplement the coal burnt in Lancashire boilers at Birmingham. It was found that, generally speaking, 1 lb. of sludge would raise at least 1 lb. of steam.

Another way of utilizing the combustible matter in sludge is to convert it into gas. The sludge may be carbonized in retorts, as is done with coal. The sewage works at Chorley were lighted for some time with gas produced in this way from the pressed sludge, the average yield being 7,000 cubic ft. of 20 candle-power gas per ton.

Gas is also produced by the spontaneous decomposition of the sludge. The sewage works at Exeter were lighted for many years with the gas from the septic tank; the Leper Hospital at Matunga (near Bombay) pumped its sewage, lighted its buildings and compound, and cooked the patients' food by the same means. Parramatta has for some years pumped the whole of its sewage with the gas from its septic tanks.

The main source of this gas is the cellulose, in the form of paper and vegetable fibre, which constitutes a large proportion of the organic matter in sludge. The gas is produced by the decomposition of cellulose by anaerobic bacteria. Omelianski has succeeded in isolating two organisms which have the power to decompose cellulose, the one producing hydrogen and the other methane, or marsh gas.

Records of the yield of gas from septic tanks are somewhat scanty; and many of the figures given are unreliable through the absence of proper facilities for collecting and measuring the gas. Observations of the yield over short periods will generally be misleading, for the gas is not liberated continuously, but accumulates in the sludge, from which it breaks away at intervals, more particularly when the relief of pressure due to a fall in the barometer causes the imprisoned bubbles to expand. The temperature of the sewage also has an important bearing on the amount of gas produced.

At Manchester in 1901, Professor Fowler obtained 1 cubic ft. of gas per 100 gallons of sewage, or 0.61 cubic ft. per head per day. The yield at Exeter was roughly estimated at 1 cubic ft. per head per day. In Mr. James's opinion it would be safe at Matunga to count on an average volume of from 3 to 4 cubic ft. per head per day. Three cubic feet per head is reported from Parramatta.

It is not necessary to generate the gas in the septic tank istelf. The retention in such a tank of large quantities of sludge which is periodically thrown up into the sewage by the evolution of gas is not conducive to the clearness of the effluent. A better plan is to remove the sludge from the tank at short intervals and to digest it in a separate chamber. The digestion of sludge in an independent tank has been carried on in many places for some years, not with a view to the production of gas, but for the purpose of reducing the volume of the sludge and rendering it inoffensive and non-putrescent. This is done on a large scale at Birmingham; and in this case the question of gas production has not been lost sight of.

A paper was read by Mr. Watson before the engineering section of the British Association at their Edinburgh meeting in 1921, giving particulars of the production of sludge at these works and the volume of gas which might be obtained from it. Birmingham produces every year not less than 400,000 tons of wet sludge, containing over 27,000 tons of dry, solid matter, of which 9,000 tos are gasified during digestion, yielding 320,000,000 cubic ft. of gas. This is within a small fraction of 1 cubic ft. per head per day for the whole population of the sewerage district. There was every reason to expect the calorific value of the gas to be from 650 to 700 B.T.U. per cubic ft.

The money value of such gas is very considerable. The Gas Light and Coke Compny, of London, is selling gas of 500 B.T.U. at 9.2d. per therm, or 3s. 10d. per 1,000 cubic feet. At the same price per therm, and assuming Mr. Watson's lower figure for calorific value, the 365 cubic ft. produced in one year per head of population would be worth 1s. 9.8d.; or at 3 s. 10d. per 1,000 cubic ft. 1s. 4.8d. The corresponding figures for a town of 50,000 people would be £4,500 and £3,500; for Birmingham, with its population of 948,000, £86,000 and £66,000; and for London, with 5,342,000 people, £485,000 and £374,000 respectively.

These are large figures, and before accepting them as the starting point for any practical proposal it is necessary to be assured that the output on which they are based can reasonably be counted on.

Yield of Gas

That gas can be produced from any ordinary sludge seems to be beyond doubt. In the case of Imhoff tanks it is often given off so copiously as to cause considerable embarrassment from "foaming" in the vent shafts.

The yield of gas might be increased in case of need by the addition of waste paper, etc., to the sludge ;and there is always the alternative of generating the gas by distilling the sludge in retorts. For the purpose of this paper, however, I prefer to confine myself to a moderate estimate of the amount of gas which can be obtained by spontaneous digestion and without any special appliances; and I trust that I have made it clear that this gas is an asset of no mean value, which a local authority would do well to turn to account.

Many otherwise promising schemes for the utilization of sludge have come to naught for want of a market for the product. In the case of gas no such difficulty arises. The gas can either be used to generate power, or as a source of light and heat; and every local authority can find a use for one or another of these commodities. In many towns power is used for pumping the sewerage or for other purposes in connection with its treatment. There is little doubt that in most cases the gas from the sludge will furnish all the power, light and heat which can be used at the sewerage works.

Many authorities, too, have housing schemes in being or in prospect; and in such cases the question of a supply of hot water may well be considered. But even with a fuel which costs nothing it is questionable whether it would ever pay to heat water at a central station and distribute it to a large area over which houses are dotted at ten or twelve to the acre. In such a case the cost of the fuel forms only a small part of the total cost of the service. The mains would still have to be laid and maintained; the heat losses would go on unchecked; and the thrifty housewife would still be robbed of her supply by her greedy or thoughtless neighbour. It would be far cheaper, and in every way more satisfactory, to pipe the gas to each house, and possibly to a centrally situated block of baths and wash-houses.

The question arises: Could an adequate supply of water be heated by the gas from the sludge?

Obviously a cubic foot of gas per head per day would not go far towards supplying hot water to every man, woman and child in the community. But the number of people accommodated by a housing scheme will rarely be a large proportion of the total population of a town. It will be interesting to see what can be done with the gas which can be obtained from the sludge from 50,000 people.

It was stated by Dr. Herzfeld, in his paper read at the sessional meeting of the institute on March 12th, 1912, that the average daily consumption of hot water by a family of five, with the usual number of servants, in a house rented at £140 per annum, was eighty gallons at a temperature of 140 deg. F., the cold water being supplied at an average temperature of 54 deg. Servants were not so scarce in 1912 as they are to-day; but, allowing only three for such a household, the total number of occupants would be eight, making the consumption of hot water ten gallons per head per day. Mr. Ingham Haden, opening the discussion on Professor Barker's paper on March 14th, 1922, said that at Manchester, with no restriction on the consumption, a household of five used 50 gallons per day, or ten gallons per head, as before. He mentioned the efficiency of a geyser as 75 per cent. Taking these figures as a basis, a household of five would need 88 cub. ft. of gas to heat its daily supply of hot water; and the 50,000 cub. ft. of gas produced each day by the sludge of 50,000 people would heat the water for 570 houses.

Cost of Manufacture

The gas would cost literally nothing, so far as manufacture is concerned. In many cases it is produced already in the ordinary course of digestion of the sludge. Engineers are turning more and more to digestion as the best and cheapest method of dealing with sludge; and even in the case of activated sludge Dr. Nasmith stated that only by anaerobic digestion can it be rendered stable and permanently inoffensive. The only expense involved in the utilization of the gas, therefore, will be that of storage and distribution.

I have, I trust, said enough to show that a well-considered scheme of sludge digestion offers many advantages:—

(1) It is a long step towards the inoffensive disposal of the sludge.

(2) It converts into a valuable manure.

(3) It yields a respectable supply of gas of high calorific value; and these substantial advantages may be obtained practically without cost and without any apparent disadvantage.

I trust, therefore, that Mr. Watson's plea for the fuller utilization of this neglected asset will not go unheeded.

Waterloo, Ont., is Having a Town Plan Prepared

Mr. Horace L. Seymour, C.E., M.E.I.C., town planning engineer of Toronto, recently presented a report to the Town Planning Commission of the town of Waterloo, Ont., as a result of a study of existing conditions preliminary to the preparations of a final plan and report.

Several matters are taken up in this report that are of general interest to Ontario cities and towns. Before the adoption of the final plan criticisms and suggestions are to be received from various civic organizations and other public bodies and finally an official hearing is to be given by wards. The appointment of a metropolitan commission is strongly advised to have jurisdiction over public utilities that affect more than one municipality.

As an aid to development there is urged the preparation of existing condition maps by counties, showing their respective possibilities and opportunities. Maps of cities and towns should be prepared showing the location of all buildings with an indication of their use, steam and electric railways and other topographical features, illustrating by graphical means paved and travelled streets, sidewalks, lots served with sewer and water, assessed values of land per foot front.

In both the city of Kitchener, Ont., where Mr. Seymour is also associated in town planning work and in the town of Waterloo, there is a strong public support which seems to assure the success of the final plans which are now being prepared.

Concrete Pipe Accepted for Sewers in Hamilton, Ont.

By the action of the city council of Hamilton, Ont., recently, concrete pipe is to be placed on the same footin as vitrified clay pipe for municipal work. This is indicated in the following extract taken from the recommendations of the Works Committee that were accepted by the Hamilton city council, at their meeting held September 11th, 1923:—

"Our investigations lead us to make the following recommendations:—

(1) That cement concrete pipe when made of selected and graded materials and tested to comply with the A. S. T. M. specifications be accepted for construction of pipe sewers in the city of Hamilton, in competition with clay tile pipe.

(2) That contracts for pipe be awarded to the lowest bidder in either product."

An Interesting Piece of Railroad Construction

Special Construction Features on Large Job —River Course Changed—Heavy Cuts and Fills

One of the largest, most compact and most interesting pieces of railroad construction being carried on at the present time is the Chesapeake and Ohio Railroad yard changes at Clifton Forge, Va., U. S. A. The estimated cost of the work is placed at $3,500,000. The improvements extend about two miles through Clifton Forge and Selma and involve better than 2,000,000 cu. yds. of excavation, construction of three bridges and two changes in the channel of the Jackson river requiring approximately 1,500,000 cu. yds. of material for fills. It is also necessary to make a change about 5,000 feet long in the State Highway, including a fill of 100,000 cu. yds. and the purchase and wrecking of about 80 residences equally divided between the villages of Clifton Forge and Selma. The contract for this gigantic piece of work was awarded by the C. & O. to the Brooks-Callaway Co., contractors of Atlanta, Ga.

The project can be divided in a general way into two parts, the construction of a receiving yard and a classification yard. The receiving yard will be about 5,000 feet long and will have two main line tracks, a car rider track and ten storage tracks each with a capacity of 100 cars. At the eastern end of the receiving yard will be located the "hump" with a 1% grade reducing to 0.4% grade as soon as clearance can be obtained. Scales for weighing cars will be placed on the hump. The hump will be about 1,000 feet in length and will run into the classification yard.

The classification yard will be approximately 5,000 feet long with 2 main line tracks, a car rider track in centre and 20 storage or make-up tracks each of 100 car capacity.

Cars from the receiving yard will be run over the hump and allowing to drift by gravity into the classification yards. Eastbound cars will be made up into separate trains and moved out. Ladder switches will all be operated by an electric pneumatic interlocking system.

Starting at the eastern end of the classification yards which is just a little west of the passenger station, begins what is known as the Clifton Forge cut, which has about 1,000,000 cu. yds. of excavation. This cut is divided into two parts by the contractors. The eastern end is being taken out in one lift with an Osgood "69" and a Marion "61" steam shovel. The western end of this cut is being taken out in two lifts by an Osgood "73" steam shovel. The face of this cut will be 73 feet when completed.

An Interesting Bridge

At the extreme western end of the Clifton Forge cut runs the Jackson River, which cuts across the yards at this point and here is found an interesting feature of construction in the bridge.

This bridge will have two abutments and three piers of re-inforced concrete on which will be placed the steel girders and on the girders will be poured a reinforced concrete slab 24 in. thick. This bridge will be 260 feet long and 329 feet wide and will carry the 23 tracks of the classification yard. It is here that the concrete sub-contractors have set up their concrete plant which will mix and pour into this bridge 30,000 cu. yds. of concrete.

Just west of the river comes the Selma or West Clifton Forge cut. This cut has 600,000 yards of excavation and is being taken out in two 25 foot lifts by an Osgood "69" and a Marion "61" steam shovel. The face of this cut will be 50 feet when completed.

Several construction pictures of a large railroad project

Just west of this cut is 1,000,000 cu. yds. fill and, due to this fill, a river change, 3,600 feet long, which requires 400,000 cu. yds. of excavation for the new channel for Jackson River.

As this fill comes in the receiving yards, it is necessary to change the river and fill in the old river bed in order to get ground for the 13 tracks of this yard.

On this river change Brooks-Callaway Co., is using a Class 24 Bucyrus dragline machine with a 100 ft. boom, and a 3½ yard Page dragline bucket. This machine has to dig a channel 3,600 feet long, 100 feet wide across the bottom with one to one slopes and 20 feet deep.

On beyond this fill and river change comes another river change 2,000 feet long involving 200,000 cu. yds. of excavation.

Other features of interest on this work are:

Two highway bridges, one an overhead highway bridge of reinforced concrete, three hundred feet long, which will pass over the yard between the east end of the receiving yard and the hump. The other is a country road bridge across Jackson River.

Due to the closeness of houses the contractors find it impossible to "dobie" and all rock has to be "popped." As a consequence of this, all shovels are equipped with air compressors for use in drilling.

Overlooked Items in Estimating Road Work

Factors Affecting Costs Whose Neglect or Improper Evaluation in Estimating Turn Theoretical Profits into Practical Losses*

When estimates are too low it is usually because either (1) all the items of cost are not considered or (2) some or all of the costs are not correctly evaluated or because both errors are committed. There probably never will be found a way of determining beforehand all the contingencies that affect cost, and there is even less chance of making a uniform and always correct appraisal of the sum that every contingency adds to cost. There must be always some guessing in setting prices for construction but that does not warrant wild and free speculation.

Qualifications for making correct estimates cannot be transmitted by gift. Neither is it possible to reduce estimating practice to a code. Judgment is a leading qualification which cannot be passed on by word, and conditions vary too much to be capable of expression in standard forms. Without, then, presuming to present a complete method of estimating—there being no such thing—it is possible to name some, perhaps a majority, of the factors influencing costs which are frequently overlooked in making estimates.

If a contractor would avoid overlooking important items entering into a bid, he must exercise, in its preparation, the same degree of industry and intelligence that he is willing and expects to exercise after the contract is awarded him. He should not overlook the fact that in estimating, "A little learning is a dangerous thing." It is unwise to accept the judgment of scantily experienced people on matters of vital concern in connection with his estimate. Also it is unwise to place too much reliance on the infallibility of the estimate made by the engineer in charge of the work, or, perhaps, any reliance at all on the estimates sometimes tendered by interested vendors. It is also well to avoid being influenced by figures which may have been submitted by other bidders on similar work at previous lettings. Costs of other contractors may be determined by factors one is incapable of measuring, with the information at his disposal; or possibly incapable of duplicating even under similar conditions, with his organization. A conservative policy to follow in estimating is to be unmindful of others who may be bidding and thereby avoid any possibility of allowing oneself to be influenced by what another may bid.

An important consideration frequently overlooked by bidders is the adding of a percentage to their bids to cover the probability of having to assume many elements of risk and uncertainty, such as Acts of God, delays and suspensions of work by owners, unusual increase or decrease in contract quantities, absence of means for legal redress for inequities or arbitrary decisions. By the unilateral form of contract under which one is generally compelled to bid, the contractor may be penalized for one or all of the above contingencies. So long as this form of contract persists, it is imperative that bidders should protect themselves by adding to their estimated costs a proper percentage to cover probable occurence of the above factors. No conservative business concern should assume risks without underwriting them. In one state, it was estimated in recent years, by a committee of representative contractors and engineers, that at least 15 per cent should be added to estimated costs to cover risks embraced in the form of contract in use.

Another general factor which should not be overlooked is a decision in advance of bidding as to proper sequence of operations and the most satisfactory and economical equipment for performing them. Such a study may have great influence in reducing the volume of labor required or in increasing the amount o fmachinery.

With the heavy advances in freight rates, in recent years, and the constantly increasing tendency to substitute machinery for labor in road building, freight on plant has become a formidable item of expense on almost every road contract. With a scarcity of labor and the resulting unrest in its ranks, losses due to transportation advanced often assume serious proportions and should be carefully approximated. The total cost of such items as leases, rentals, camps, warehouses, traveling expenses, legal expenses, demurrage charges, telephone and telegraph bills, compensation, fire and public liability insurance and interest charges, is impressive and none of these items should be overlooked. In estimating interest charges, thought should be given to probability of delay in payment either on monthly or final estimates and also to whether or not allowances will be made for materials stocked on the work.

Carrying Work Over

With the increasing size of road contracts and the growing practice of letting contracts throughout the year, increasing volumes of work have to be carried over the winter into a second season. The additional cost is an important estimate item. Again, in using previous costs, consideration must be given to whether these costs were achieved under the direction of a more competent superintendent and a more efficient organization than is likely to be available for the work on hand. Other items which have to be considered are soil and topography, right-of-way, and structural obstacles in their relation to wet weather, transportation and the probable duration of the working season for the locality.

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*An interview with Henry H. Wilson, a prominent U.S. road contractor by C. S. Hill in Engineering News-Record.

The probable character and ability of engineers and inspectors should not be overlooked. In a particular state highway department, one will often find considerable variation in this matter and a consequent reaction on costs. If there are many engineering complications on a contract, one may encounter considerable delay and expense if the engineer is inexperienced, procrastinating or too busily engaged with other contracts to give one's problems prompt and conclusive attention.

It is well, first last and always, to remember that there is as much in conditions as there is in prices. Successful estimating is as often the result of one's skill as a prophet as it is a matter of his industry.

(To be continued)

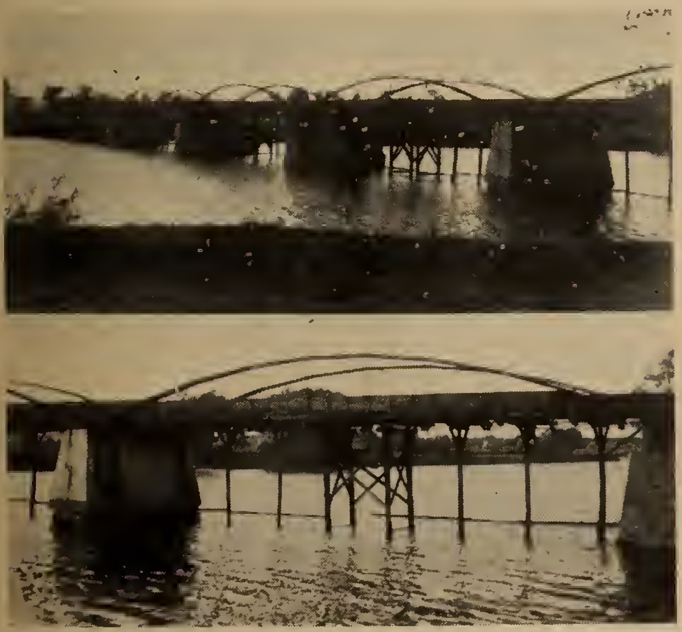
A Recommended Building Code

The Portland Cement Association has issued, in the form of a 50-page book, a "Recommended Building Code" for cities with populations from 25, to 150,000. It has been published in the interest of better and more firesafe construction.

Hints for the Contractor

Supporting Weak Bridge for Heavy Overload

In the construction of the road from Cayuga to Canborough, Ont.,—a portion of the Niagara Falls—St. Thomas highway—the contractors had to haul heavy loads of crushed stone over the bridge crossing the Grand River. This bridge was a 5-span structure, quite inadequate for heavy loading and consequently the haulage contractors had to take measures to strengthen the structure for the weight of their heavy trucks. The illustrations herewith indicate the procedure adopted. Under each span was erected centering composed of single struts with crossarms and knee braces. At the centre where the pending moment was greatest, a framing of two timber bents was used. These were cross braced and the whole system tied longitudinally close to the water level and just below the knee braces. The shallow water in the river and the smooth river bottom facilitated this work. The result of it was that the bridge was amply fortified for heavy loads and suffered no damage.

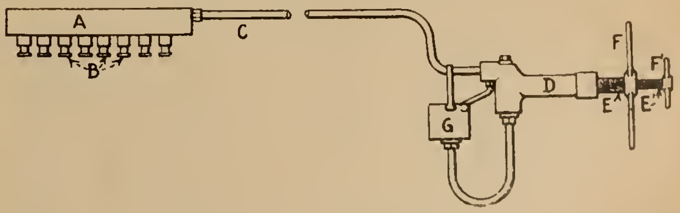


Bridge over Grand river strengthened by timber posts

Breaking Up Old Concrete by Hydraulic Pressure

Removal of old concrete is often difficult and costly work. Use of hammer and wedge is slow and laborious. The work is often in a confined or populous area and the use of explosives might be dangerous, or even prohibited. Hydraulic power can often be turned to good account in this direction through the medium of a simple tool, the hydraulic mining cartridge.

Referring to the sketch herewith taken from Engineering News-Record: pressure cylinder A has fitted to it, rams B. It is connected by steel pipe C to pump D. The plungers of the pump are operated by screws E and E', to which are attached handles F and F'. The tank G holds about a quart of water, cylinder A and piping being first primed. After this is done pressure is applied by the large handle and screw and final pressure by the small handle and screw.



Hydraulic ram for breaking concrete

The average pressure obtainable is 4 tons per square inch, and the machines are made with five, six and eight rams, the largest size, which is 4 in. in diameter and has eight rams, can exert a pressure of

240 tons. This pressure is used to split up the concrete or other mass into large blocks.

To operate a hole is first drilled. For a 4-in. machine this would be a 4-in. hole, some 36 in. deep. Into this is inserted the tool, the faces of the rams bearing on little plates of 3/8-in. flat bar. It will be seen that the tool itself is very simple, but it requires machining from very strong material.

The arrangement of the pump shown here is not binding; provided sufficient pressure is available it can be obtained from a high-pressure hydraulic supply if handy, or from an ordinary hand-pressure pump of the type used with tire and axle presses. Generally speaking, however, a pressure of from 3 to 5 tons per square inch is required.

Regulations Affecting Design of School Buildings

(Continued from last issue)

The minimum unobstructed width of corridors and passageways which are used by the public or by the occupants generally shall be determined the same as the width of stairways and shall in no case be less than 4 feet. Corridors and passageways serving as a means of egress shall be at least equal in combined width to the required width of the stairways or passageways leading to them.

Section 80. Scuttle

Every building more than one storey in height shall have a permanent means of access to the roof from the inside. The opening shall be not less than 20 x 30 inches and there shall be a permanent ladder or stairway leading thereto.

Section 81. Rooms, Windows and Lights

Floor Space, Height, Glass Area, Lights. The minimum floor space of school or classrooms shall be:

For primary grades, 12 square feet per person.

For grammer grades, 14 square feet per person.

All others, 16 square feet per person.

Note. These are minimum requirements. A more liberal allowance of floor space (16 to 20 square feet per person), is recommended.

All class, recitation and study rooms (not including manual training or domestic science rooms) shall be at least 12 feet high in the clear. All other rooms shall be at least 8 feet high in the clear.

Windows shall be placed either at the left or at the left and rear of pupils when seated. The tops of windows (except in libraries, museums and art galleries) shall not be placed more than 8 inches below the minimum ceiling height as established in the preceding paragraph.

In study, class, rectitation and laboratory rooms there shall be at least one square foot of glass surface (windows and skylights) for every 6 square feet of floor surface, if the room is lighted from the left side only. If lighted from the rear as well as from the left, the glass area shall be at least one-fifth of the floor area.

All windows shall be placed in the exterior walls of the building; except that halls, corridors, stock and supply closets may be lighted by ventilated skylights or by windows placed in interior walls or partitions. Museums, libraries and are galleries may be lighted by skylights.

The width of all study, class and recitation rooms (measuring at right angles to the glass surface) when lighted from one side only shall not exceed two and one-fourth times the height of the window head above the floor.

Each classroom shall be large enough to accommodate forty-five pupils and shall be at least 23 feet wide by 32 feet long.

Eight feet shall be reserved at the end of the room for the use of the teacher. The corresponding wall space may conveniently be provided with a blackboard to contain programs, etc. The teacher's desk shall always be placed at the end of the room and not on the long side.

Window sills shall be from 6 to 42 inches above the floor; for grades above the fourth, such height shall be 42 inches.

At the front of the room, eight feet of blank wall shall be left between the front corner and the first window. In classrooms lighted from the side only, this blank wall may be reduced to four feet; the first window shall then be provided with shade for use on bright days. Windows shall extend as close as possible to the rear corner.

Outlets for at least four electric lights shall be provided for each room of standard size.

Blackboards shall be from 24 inches (for primary grades) to 30 inches (for upper grades) above the floor, and from 36 to 48 inches high. A wide aisle shall be provided next to all blackboards.

Window Shades. Classroom windows shall be equipped with window shades adequate for the purpose of excluding direct sunshine or excessively bright light from the sky.

These shades must perform several functions, namely, the diffusion of direct sunlight, the control of illumination to obtain reasonable uniformity, the elimination of glare from the visible sky and the elimination of reflected glare from the blackboards. Each window shall be equipped with two shades operated by double rollers placed near the level of the meeting rail. (Shades so placed may be raised or lowered from the middle, which provides flexibility for shading and diffusing the light.) The material of the shade(preferably yellow or tan colored) must be sufficiently translucent to transmit a considerable percentage of the light while at the same time diffusing it.

An alternate method of shading that will be permitted consists of two independent sets of shades at each window. The one, a translucent shade, shall roll from the top down; the other, a very dark, heavy shade (preferably green) shall roll from the bottom upward.

Note. Since it is the top portions of the windows that supply the illumination to the spaces farthest from the windows it is bad practice to shut out bright light by pulling down an opaque shade from the top, as this will leave the areas farthest from the windows with inadequate illumination.

Basement Rooms. No class, recitation, or study room (not including manual training or domestic science rooms) shall have its floor more than 2 feet below the adjoining grade. Manual training and domestic science rooms, toilet rooms, and other rooms used by pupils (not including playrooms) shall have ceilings at least 4 feet above grade. The walls and floor of every basement room used by pupils or students shall be waterproof and dampproof.

Section 82. Assembly Halls

A room which seats or accommodates 100 or more persons is governed by the requirements of the part published in the last two issues, except as follows:

The minimum width of any exit doorway used by children under 14 years of age may be 2 feet 8 inches (instead of 3 feet 4 inches); but in any case the aggregate width of such doorways shall be in accordance with the previous instalments.

Assembly halls in schools shall be placed on the first floor, to avoid the danger of panic.

Section 83. Seats, Desks and Aisles

Seats, chairs and desks (except those used by teachers) in class recitation, or study rooms seating more than 50 persons shall be securely fastened to the floor; or not less than four seats (of two seats and two desks) shall be fastened together.

Class and schoolrooms shall have aisles along all walls.

In primary rooms, intermediate aisles shall be not less than 17 inches, and wall-aisles not less than 2 feet 4 inches in width.

In grammar rooms, intermediate aisles shall be not less than 18 inches and wall aisles not less than 2 feet 6 inches in width.

In high school rooms and in all other class and schoolrooms, intermediate aisles shall be not less than 20 inches and wall aisles not less than 3 feet in width.

Assembly hall seats and aisles shall conform to the requirements for assembly halls (Sections 64 and 65).

Section 84. Boiler and Furnace Room

In buildings of more than one storey all boiler or furnace rooms, fuel rooms and laundries shall be enclosed (together with breaching) with fireproof floor and ceiling and with incombustible walls at least 8 inches thick (or 5 inches thick if of reinforced concrete) with all openings protected by standard fire doors. Such boiler or furnace shall be separated as effectively as possible, either by distance or by partitions and doors, from all stairways leading to the first floor, and especially from stairways which lead continuously to the upper floors.

Note. Boilers and furnaces are strongly recommended to be placed in separate buildings. This will eliminate the most frequent cause of school fires.

Section 85. Toilet Rooms.

School buildings shall have the following sanitary equipment:

One water-closet for every 20 females or fraction except for grammar and primary grades where there shall be one water-closet for every 15 females or fraction.

One water-closet and one urinal for every 40 males or fraction, except for grammar and primary grades, where there shall be one water-closet and one urinal for every 30 males or fraction.

A drinking fountain and sink shall be installed in each storey and basement, for each 6,000 square feet of floor area, or fraction. Drinking fountains shall not be installed in toilet rooms.

One washbowl shall be provided for every two closets or urinals.

Section 86. Ventilation

All parts of the building generally used by the public or the occupants, except the corridors, passageways and stairways, shall be provided with fresh air at the rate of at least 1,200 cubic feet per person per hour. The fresh air shall be taken from the outside of the building and no vitiated air shall be reheated unless washed by a chemical air washer of approved design; in such case not less than one-third of the required air shall be taken from the outside.

Where no fan is provided, the area of heat flues for class rooms shall be at least 1/200 of the floor area and the area of the cold air inlet, also of vent flues, shall be at least 1/250 of the floor area. If no fan is provided and steam heat is used, there shall be at least 160 square feet of radiating surface at the base of the fresh air flue for each room which will accommodate 40 pupils, and corresponding amounts for larger or smaller rooms. Every heating plant shall include adequate provisions for humidifying the air.

Foul air outlets shall be placed in the wall, flush with the floor, and not provided with gratings. Fresh air inlets shall be 7½ or 8 feet above the floor. Floor registers are not recommended; registers for warming the feet may be placed in the baseboard. Fresh air shall be taken from the outside through a fresh air room and not admitted directly from the outside. For heating the building while unoccupied, a return flue may be provided with wing register in the wall (not the floor).

In gravity heating and ventilating systems the vent flue shall not open into the attic but shall be carried through the roof. Where a fan is used the flues may open into the attic provided the attic has a tight floor and sufficient ventilation through the roof is provided.

The heating and ventilating systems should be considered as a part of the general design, and should be laid out by, or in collaboration with, the architect. The contract for such systems should not be let until the general design has been worked out.

The heating and ventilating systems must be subjected to a satisfactory test during cold weather, the city meanwhile withholding 25 per cent of the contract price or requiring an equivalent bond.

Section 87. Lighting

Artificial Lighting. Each classroom of standard size (32 feet long by 23 feet wide) shall be equipped with at least four artificial lighting units symmetrically spaced.

At least one circuit of 660 watts capacity shall be supplied to each standard classroom.

Section 88. Standpipes and Fire Extinguishers

In every building which is more than one storey high and which is not provided with interior standpipes, standard chemical fire extinguishers shall be provided in the proportion of one extinguisher to each 3,000 square feet of floor area or fraction in non-fireproof buildings, or one to each 8,000 square feet of floor area or fraction in fireproof buildings; but there shall be at least one fire extinguisher on each floor including basement. All fire extinguishers shall be prominently exposed to view and always accessible.

Automatic sprinklers will be required in all parts of the basement where combustible material is likely to be stored.

Section 89. Fire Alarms

Every building two storeys or more in height shall be provided with a proper alarm or gongs which can be operated from any storey, including basement, and can be heard throughout the building. Such alarm system shall be tested at least once a week.

Note on Motion Picture Stage and Booths

(For motion picture booths and stages in schools see Section 58).

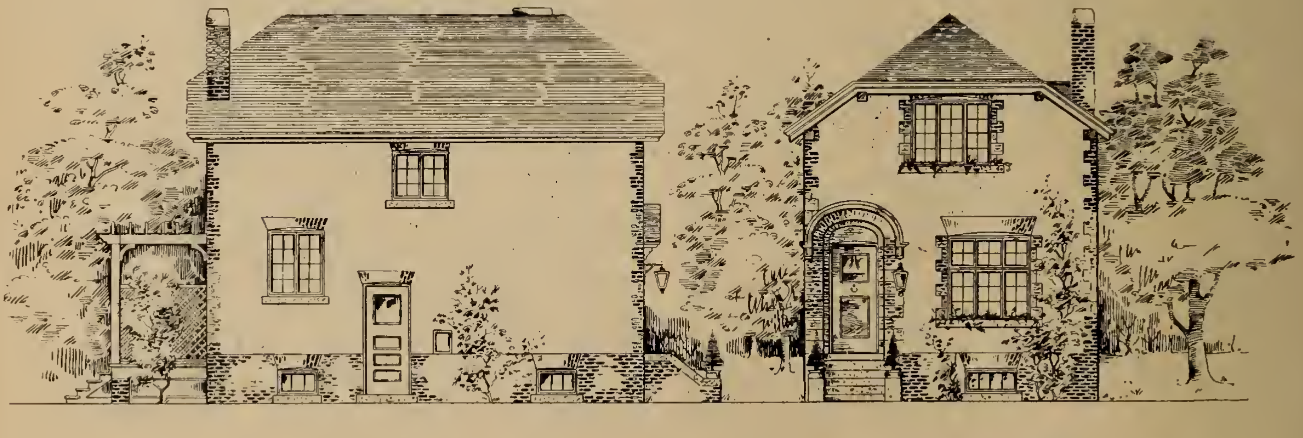
The Contract Record's

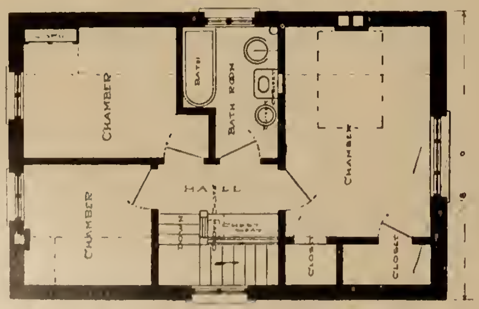
Weekly House Suggestion No. 83

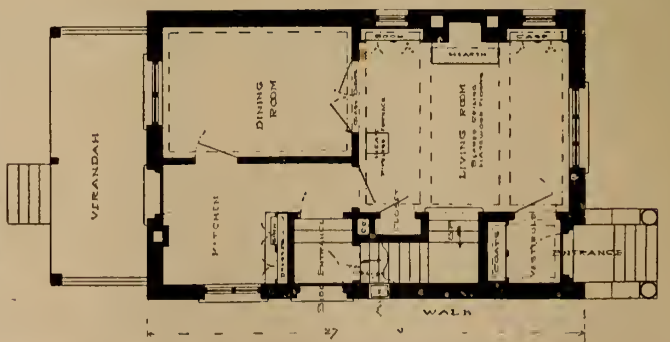
We are presenting herewith illustrations of a well laid out, reasonably priced house, erected recently in a suburban district of Toronto at the very moderate cost of $3,500. The house measures 18 x 27 ft.

There is a full basement, the foundation walls are of concrete. The general construction is of brick and hollow tile, finished with stucco surface, and having slightly projecting corners and trimmings to openings of tapestry brick. The windows are all steel casement sash, having wide inside sills and plastered reveals. The roof is covered with asbestos shingles. The main door having reveal, trimmed with brick and with circular hood, gives a very pleasing and massive effect, combined with simplicity. The vestibule is fitted with coat closet. A door fitted with small lights gives access to a charming living room, having tapestry brick fireplace mantel, fitted with built in bookcases and small casement windows at sides. The ceiling is beamed, with open stairway. Glass doors lead into the dining room, which has casement windows giving pleasing view to rear verandah and garden. The trim is of fir, with hardwood floors throughout. The side entrance is arranged for easy access from kitchen, and other parts of house, with stairs to cellar, taking up the minimum amount of space. The upper hall is light and airy, with easy access to the three bed rooms, and three piece bath room. A striking feature of convenience is the cedar chest built in at stair landing, forming seat, and storage of linen, with clothes-chute to laundry tubs in basement. The heating system is hot air, of pipeless type.

Mr. P. C. Palin, architect, McKinnon Building, Toronto, is the designer of this house.







Mainly Constructional

East and West—From Coast to Coast

The new dry dock at Courtenay Bay, N. B., being built by the St. John Dry Dock & Shipbuilding Company, Ltd., will be officially opened next month.

The Beaver Truck Company, of Hamilton, will build two large factory buildings at Brampton, Ont., one 100 x 350 ft. and the other 120 x 70 ft., both to be of steel and concrete construction. A site of 5 acres has been purchased and the program of construction will involve an expenditure of approximately $150,000. The company will employ about 125 men and expect to turn out a truck a day at their new plant.

Debenture tenders are being called by the town of Oakville, Ont., for money to finance the proposed construction of an addition to the local high school, to cost $52,000 and for an extension to the water system to cost $3,000.

New sewage filter beds in the River Thames were urged at a recent meeting of the London board of health, by Dr. W. S. Downham, the local medical health officer. The probable cost is roughly computed to be in the neighborhood of $400,000. A recommendation that a survey of the situation be immediately considered will go forward to the board of works. City Engineer W. P. Near will be asked to bring in a special report upon the city's entire garbage facilities.

The Port Arthur Shipbuilding Company has been awarded the contract for building the steel towers for the Hydro-electric power lines between Cameron Falls and Port Arthur, Ont., a distance of 80 miles, at a cost of $200,000. This company is also filling a $70,000 order for pulp-mill machinery for the new plant of the Great Lakes Pulp and Paper Company.

Mr. George W. Lee has announced that no further contracts for the extension of the Temiskaming & Northern Ontario Railway beyond the first 70 miles north of Cochrane will be awarded this year. The original intention of the commission was to call for tenders in August or September for the construction of the remainder of the proposed extension right up to Moose Factory, at the mouth of the Moose River.

At one of the daily meetings of the Fair Board, held during the Western Fair at London, Ont., President J. H. Saunders and Mr. E. S. Little were appointed a committee to seek government assistance in the building of a $200,000 live stock building at the fair grounds. Civic and county aid will also be sought and a campaign for funds will be organized. This is the largest item in a program of developments planned by the Board. Two more sections will be added to the grandstand and an additional 30,000 sq. ft. of land will be purchased.

A report from Bridgeburg, Ont., states that the New York Central and Canadian Pacific incorporators of the Niagara Bridge Company a few days ago received official consent of the Public Service Commission of New York State at Albany, and, according to Attorney Maurice C. Spratt, will immediately go ahead with construction of two bridges, one from the American mainland to Grand Island, in the Niagara River, and the other from Grand Island to Black Creek, six miles from Bridgeburg.

An announcement from British Columbia states that the new Ballantyne pier at Vancouver, construction of which started two years ago, will be open for business the first week of October. The pier is 1,200 feet long on one side and 1,070 feet on the other, and 341 feet wide. It will accommodate two ocean vessels on either side and one at the outer end. When the shore keys are completed there will be accommodation for two more vessels. There are four sheds on the pier, three of them 500 feet long and 110 feet wide, and one 408 feet long and 110 feet wide. There will be the latest facilities for loading and there is provision for 8,000 feet of trackage.

Nearly $17,000,000 is to be asked from Germany by the Dominion Steel Corporation and six of its subsidiary companies, and the Nova Scotia Steel and Coal Company, to cover losses sustained during the war. Torpedoed vessels under charter, chartered steamers requisitioned, costs of substituting requisitioned vessels, losses of contracts and war risk premiums are the headings under which the claims are listed. Hearing of these claims, began at Montreal recently before the Hon. Dr. Wm. Pugsley, commissioner appointed by the Government to investigate and report on all Canadian war reparations claims. The actual total is $16,711,170.

Fire losses in Canada during the week ended September 12, are estimated by the Monetary Times at $571,500, compared with $1,199,300 for the same week last year.

Pickering and Sons' builders, of Toronto, announce that they will erect immediately a large number of solid brick bungalows on St. Clair Ave., east, near Dawes Road.

A recent announcement it to the effect that a large industry contemplates locating on the west side of Bathurst St. extension, Toronto, the new land reclaimed by the Harbor Commission. This company will build a $1,000,000 factory here. Their building will be located over the Garrison sewer and one of the concessions demanded by the company was freedom from the liability of any necessary repairs to this sewer being made from inside their building. The city has granted this concession, though Commissioner Harris states it would cost $100,000 to repair the sewer, in case of a break, from the outside.

Work on the completion of the tower at the Parliament Buildings, Ottawa, will be commenced next spring and completed, it is expected, by the fall of 1924. There remains about 150 ft. to be added to the tower, which will be about 300 ft. high when completed.

The new Neebing Terminal of the C.N.R. at Fort William, Ont., was opened recently. The yards are equipped with the most modern buildings and plant of their kind to be seen anywhere.

North York Twp., Ont., reports building activity brisk, permits for the first week of the present month amounting to $174,150. If this activity remains for a while it is quite likely a new building record will be reached this year. The great majority of the building program consists of houses, several new streets, completely built up, having been established during the past year.

A recent registration at Montreal is that of A. Berard & Company, to carry on a general contracting business.

The Spencer Construction Company was a recent registration at Montreal, East.

Personal

Mr. R. J. Durley, secretary of the Canadian Engineering Standards Association, arrived home recently from Geneva, Switzerland, where he had been representing Canada at the International Conference on Industrial and Engineering Standardization.

Obituary

Ex-mayor Joseph Battle, of Thorold, Ont., at one time prominent in construction circles throughout the province, died at his home in Thorold recently, aged 62 years. He carried out several railway and canal construction projects and operated a fleet of tug boats on the Welland Canad a few years ago.

CONSTRUCTIONAL ACTIVITY

Period of Sept. 19 to Sept. 25, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Belleville, Ont.
Tenders will be called shortly for a gasoline driven pump approminately 3 million gallons capacity; also pumping station building. Total cost about $25,000. Messrs. Gore, Nasmith & Storrie are the engineers.

Montcalm, Man.
Tenders will be received till October 2 by the municipality of Montcalm, through the secretary-treasurer, Ed. Comeault, Letellier, Man., for grading and draining of, and placing the necessary pipe culverts. Plans and specifications with Highway Commission, Parliament Bldgs., Winnipeg, and secretary-treasurer.

Port Credit, Ont.
Tenders will shortly be called for an addition to the waterworks system. Gore, Nasmith & Storrie, Toronto, are the engineers in charge.

CONTRACTS AWARDED

Beauceville-Sherbrooke Highway, Que.
The contract for gravelling roads has been awarded to Thomas Desbiens, St. Louis de Chambord, at $34,960.66.

Coquitlam, B. C.
The contract for roadwork on the Dewdney Trunk Road, costing $16,500, has been awarded to the General Construction Co., Vancouver, B. C. Work to be done on unit basis.

Leclercville, Que.
La Cie de Construction de Trois Rivieres, have been awarded the general contract for water macadam pavement costing $27,609.

Marchwell, Sask.
R. H. Bond, Dubuc, Sask., is the general contractor for roadword from Marchwell to Langenburg, Sask., to cost $11,300.

North York Twp., Ont.
The township council has awarded the following contracts for paving: Don Woods Dr. & Dennis Ave. at $11,824—Asphaltic Concrete Co., Ltd., Toronto; stone and Gravel road at $13,039—Orr & Clarke, Toronto.

Niagara Falls, Ont.
The city council has awarded the contract for 3,000 lineal feet of 24 in. dia. No. 1 sanitary sewer pipe to the Independent Concrete Pipe Co., Ltd.

Point Grey, B. C.
The contract for concrete walks and curbs costing $6.017, has been awarded to Ritchie Supply Co., Ltd., Vancouver.

South Vancouver, B. C.
Ritchie Supply Co., Ltd., Vancouver, B. C., are the general contractors for concrete paving to cost $17,000.

St. Athanase, Que.
The contract for oil macadam pavement has been awarded to Louis Zuanetti, Pointe A'Pic, Que., at $15,219.

St. Thomas, Ont.
Clay Products Agency, Ltd., of Toronto, have been awarded the contract for 1,700 ft. vitrified segment sewer block and 1,500 ft. vitrified storm water pipe. Mitchell Contracting Co. of London, Ont., are the general contractors.

St. Stanislas de Kostka, Que.
O'Connor Bros, Huntington, Que., have received the contract for refection of macadamized roads at $7,264.63.

Windsor, Ont.
The city council has awarded the contract for pavement to Premier Construction Co., Walkerville, Ont., at $19,688.

The city council has awarded the contract for pavement to Cadwell Ltd, Sandwich St. W., at $12,829.

Walkerton, Ont.
The town council has awarded the following contracts in connection with waterworks system; standpipe—Hunter Bridge & Boiler Co., Kincardine, at $6,559; gasoline engine and motor driven pump—Goldie, McCulloch Co., Galt, Ont.

Public Buildings, Churches and Schools

Alexandria, Ont.
Tenders are being received till October 10 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs.,Ottawa, for the erection of a public building. Plans and specifications at offices of chief architect, Ottawa, Postmaster, Alexandria, and mech. engineer, Dominion Public Bldg., Montreal.

Almaville, Que.
The R. C. Parish contemplate the building of a $40,000 church. Work is expected to go ahead this Winter.

Galt, Ont.
Tenders are being received toll October 1 by the city council, through J. S. Wardlaw, 10 Dickson St., for the rewiring of Galt Collegiate Institute. Plans and specifications with J. S. Wardlaw and A. P. Gundry, care of above institute.

Guelph, Ont.
Jno. V. Gray Construction Co. Ltd., 541 Queen East, Toronto, are submitting a bulk tender and want prices on all subtrades in connection with alterations and addition to St. Joseph's Hospital.

London, Ont.
The Western Fair Board contemplate the erection of live stock building and alterations to other buildings at an estimated cost of $20,000.

Montreal, Que.
J. E. De Patrick, architect, 381 4th Ave., is preparing plans for a $200,000 college near Mile End, for the Italian Association. Tenders will be called this Winter.

Tracadie, N. B.
Tenders are being received till October 10 by the Dept. of Public Works. through the secretary, R. C. Desrochers. Parliament Bldgs., Ottawa, Ont., for installation of electric wiring and fittings in the Lazaretto. Plans and specifications at offices of chief architect, Dept. of Public Works, Ottawa, resident architect, Dept. of Public Works, St. John, and medical superintendent, Lazaretto, Tracadie, N. B.

Toronto, Ont.
The Board of Education has purchased a site in the east end for the erection of a High School of Commerce to cost $200,000.

Vancouver, B. C.
The city of Vancouver contemplate building $40,000 bath house at Kitsiland Bathing Beach. A. S. Wooton, Dawson Bldg, Vancouver, is the architect.

Westville, N. S.
The foundations are going in for a $16,000 Oddfellowe Hall. Walter Chisholm has the contract for excavation and foundations, and Zeph. Murdock the contract for electrical work.

CONTRACTS AWARDED

Edmonton, Alta.
The contract for alterations to heating Public Building has been awarded to Ideal Plumbing & Heating Co., Ltd., at $8,203.

Fairville, N. B.
The general contract in connection with $70,000 orphanage to be built has been awarded to H. O. Clark, Water, St. John; plumbing and heating- W. E. Emmerson, West St. John; electric—Vaughan Electric Co., St. John. ... ...

Fredericton, N. B.
The foundations are in for a $125,000 memorial building for the University of New Brunswick. Sub-trades as follows have been let; structural steel; Eastern Canada Steel & Iron Works, Ltd., Quebec; cut stone—A. S. Wewar, Wallace, N. S.; millwork—Rhodes Curry Co.. Amherst, N. S.; roofing—Asbestos Mfg. Co., Ltd., Montreal; sheet metal, plumbing and heating—D. J. Shea, Fredericton, N. B.; tiling—The Nonnenman Tiling Co., St. John, N. B.; plastering—B. Mooney & Sons, general contractors; Electric, not yet let.

Girvin, Sask.
E. N. Miller, Girvin, Sask., is the general contractor for a $6,000 church.

Halifax, N. S.
The following contracts have been awarded in connection with a $50,000

power house being built for the Dalhousie University; chimney—Summerhays Co., W. H. Noonan, Agent; heating—Farquhar Bros.; plumbing—W. M. Walker, 104 Duncan St.; roofing—James Donohue, Bedford Row. All of Halifax.

Hamilton, Ont.
W. J. Smith, 218 Gage Ave. S., has the general contract for a $7,500 church to be built for the Grace Anglican Church.

Lethbridge, Alta.
Walker & Holderton, Lethbridge, Alta., have been awarded the contract for alterations to heating of Public Building, at $6,740.

Montreal, Que.
J. C. Frennette, 324 Breboeuf St., is the general contractor for school for Parish St. Pierre Claver. Architects—Bernier & Despatie, 294 St. Catherine East. Painting—Bergeron & Belanger, 324 Berboeuf. Plastering to be let.

The stone work is now going up for the new city hall. J. A. Durocher, 291 Chambley St., has sub let the roofing to M. Chouinard, 151 Adam St.

The following trades have been let on $35,000 church being built for the Church of England; painting and glazing—Fryer & Mathewson; tiling—J.H. Dodgson Co., 745 St. Catherine W.

A. F. Byers & Co., 340 University, are the general contractors for a $16,000 church on Holt St. for St. Lukes Church.

The following sub-trades have been let on $228,111 school being built for the Protestant School Board; masonry—Morrison Quarry Co.; millwork—Daniel Cream, Ltd.; painting and glazing—Curwood & Co.; ornamental iron—Federal Iron Works; roofing—Metal Shingle & Siding Co., Ltd.

Outremont, Que.
The foundations are going in for a school on Lajoie Ave. MacVicar & Heriot, 628 Union St., are the architects. McRitchie & Black, 14 Sussex Ave., are the general contractors; roofing—Metal Shingle & Siding Co.; electric—J. A. Anderson, 205 Mansfield.

Ottawa, Ont.
The city council has awarded the following contracts on $40,000 fire station; general contractors— Ed. Monette, King Edward St., at $24,500; plumbing—The Garth Co., at $900.00; heating—McKinley & Northwood, at $2,377.

Port Hope, Ont.
Work is in progress for additional and alterations to Childrens Shelter. General contractors— T. Garnet & Son; heating—Geo. Millward; electric—C. Pillsworth; painting—R. Sainsbury.

Quebec, Que.
The city council has awarded the contract for a fire station to be built on Kitchener St., to Adelard Deslauriers, 400 St. Francois St., at $42,090.

Regina, Sask.
The general contract for alterations to heating of Public Bldg., has been awarded to Wagg & Wilson Co., Regina, at $4,644.

Sydney, N. S.
Chappells Ltd., have received the general contract for a $35,000 community building for the Presbyterian & Methodist Missions.

Tecumseh, Ont.
The general contract for addition to school to cost $40,500 has been awarded to Urgel Jacques, 690 Dougal Ave., Windsor, Ont.

Timmins, Ont.
The High School Board has awarded the general contract for a high school to Schultz Bros., & Co. Ltd., Brantford, Ont.

Toronto, Ont.
The walls are going up for a $55,000 church on west side Shaw north of College. Architects—Gordon & Helliwell; masonry—Gratton Ltd., 486 Clinton St.; painting—Barten & Dillon; electric—Harris & Marson.

The Board of Education has awarded the following contracts for school work; ash hoist, Jarvis Collegiate $795—Elevator Specialty Co., Ltd.; metal lockers $5,620—Geo. Meadows Co. Ltd., entrance enclosures $938—C. W. Hurndall, 14 Munro Park; painting at Kew Beach $665—Jas. Cassey, Dalhousie; painting at Clinton $750—Pinnemore Painting & Decorating Co.

The following sub-trades have been let on subsidiary buildings being built on Bathurst St. for the Toronto Transportation Commission; steel sash, rolling steel doors, kalamein and fire doors—A. B. Ormsby Co., Ltd., millwork—Myers Warren Lumber Co.; gypsum roof—Ebsary Gypsum Co. Ltd.; steel and ornamental iron—McGregor & McIntyre, Ltd.

Business Buildings and Industrial Plants

Brampton, Ont.
The Beaver Truck Corporation, Ltd., of Hamilton, are having plans prepared for the erection of a $150,000 factory in Brampton.

Elora, Ont.
Work is to start shortly on the remodelling and extension to plant of T. E. Bissell Co., to cost $10,000.

Fort William, Ont.
The Great Lakes Pulp & Paper Co., Ltd., Fort William, contemplate building a $3,000,000 pulp and paper mill. Reinforced concrete, brick and steel construction. Construction engineer is Howard Ferguson, New York, N. Y.

Kitchener, Ont.
W. H. Dunker, 58 Louisa St., is having plans prepared for a $20,000 business block on King St. West.

London, Ont.
Penmans Ltd., contemplate an extension to their factory.

Montreal, Que.
D. J. Spence, architect, 246 Beaver Hall Hill, is preparing plans for a garage corner Mountain & Osborne Sts., for Ledoux, Jennings, Ltd. Tenders will be called shortly.

Tenders are being received by the owner, A Lafortune, 5776 Sherbrooke W., for the erection of a $28,000 store. No closing date set. Plans and specifications with owner.

Owen Sound, Ont.
The foundations are in for an $8,000 warehouse on Third Ave. East, for Keenan Bros.

Quebec, Que.
In connection with a $500,000 refrigerator to be built at corner Dalhousie & St. James Sts., tenders are being received till October 10 by the Quebec Harbor Commission, through the secretary, Charles Smith, on building complete or for following items separately; machinery—including piping, power wiring in the power plant, complete and running etc.; piping—including all cooling coils and connections from and to the brine coolers, heating apparatus and air conditioning machines, airducts etc.; electric wiring—for lighting of all buildings; elevators in main warehouse and fish warehouse; sprinklers in main warehouse and fish warehouse buildings—including everything to make the plant complete except as mentioned above. Plans and specifications with Quebec Harbor Commission. Engineer in charge is General Tremblay.

Regina, Sask.
Waterman, Waterbury Mfg. Co. Ltd., are the owners and builders of a warehouse corner Rose and 8th Ave., costing $18,000.

Sahtlam, B. C.
The Yellow Fir Lumber Co., Sahtlam, B. C., contemplate building a $50,000 sawmill. Tenders will shortly be called.

Toronto, Ont.
Work is to start at once on a $13,000 public garage at 1882-4 Yonge St. Tenders are being received by the owners, McCann Bros., 1888 Yonge St., on masonry, roofing, etc. No materials purchased. B. Brown, 487 Spadina Ave., is the architect in connection with addition to plant of City Dye Works, at 138 Claremont St. Tenders being received by architect for all trades.

Dominion Wheel & Foundries, Ltd., contemplate an addition to their plant at 131 Eastern Ave. Bulk tenders are being received by the manager, S. J. Neil on complete building.

Bulk tenders are being received by the architect, F. A. Mallory, 164 Bay St., on all trades in connection with a garage and office at 367 Dupont St. Plans and specifications with architect.

Windsor Mills, Que.
Tenders are being received by Mr. Prattes, 21 Wellington West, Toronto Ont., for plumbing, heating and sprinklers for $100,000 factory being built for Kilgour Bros., Toronto.

CONTRACTS AWARDED

Brampton, Ont.
The excavating work has started for an $8,000 factory for the Stacey-Wagner Chrome Leather Co., of Simcoe, Ont. Concrete work is being done by W. T. Heathley, Brampton. No materials purchased.

Brandon, Man.
H. G. Fletcher, 916-6th St., Brandon, is the general contractor for an addition to store costing $8,000, for the Olympia Candy Co.

Campbellton, N. B.
The foundations are in for a $150,000 hotel on Roseberry St. J. & D. A. Harquail Co., are the general contractors. Architect—A. I. Morrison, Campbellton.

Halifax, N. S.
Work is to start at once for a $5,000 warehouse to be built on Water St. for

O'Leary & Lee, 39 Upper Mater St. Architects—Pickings & Roland, Roy Bldg.; general contractors—W. F. Bedwin Co., Ltd.

Anglin-Norcross Ltd., are the general contractors for a $3,000,000 office building being built for the Insurance Exchange Corp. Ltd. Architect—D. J. Spence, 246 Beaver Hall Hill; ventilating—The Garth Co, Ltd.; ornamental iron—John Watson & Son.

Fussing & Jorgensen have the general contract for a $35,000 factory on Baby St., and will buy all materials.

Treversey Ltd., 136 Papineau, are the general contractors for repairs costing $30,000 on bank at 532 St. James St. Masonry—Morrison Quarry Co.; marble & tiling—Smith Marble & Tile Co.; electric—Vincent & Say; ornamental iron—Canadian Welding Works; mastic flooring—Geo. W. Reed, 37 St. Antoine St.

The laying of concrete has started on $3,000,000 office building being built on St. James St. for the Insurance Exchange Corporn. Ltd. D. J. Spence, 246 Beaver Hall Hill, is the architect. General contractors—Anglin-Norcross, Ltd.; millwork—James Davidson's Sons, Ottawa.

Sarnia, Ont.

Sub-trades as follows have been let on 4 stores and offices costing $35,000 being built corner Christina & Cromwell Sts.; electric—Chambers Electric Co.; plate glass and metal store fronts—Consolidated Plate Glass Co. of Canada, Ltd., Toronto.

The foundations are in for a $25,000 office building for the Canadian Observer Printing Co. Following contracts have been awarded; general contractor and carpentry—W. D. Griffin; masonry—Thos. Grace; steel—Sarnia Bridge Co.; millwork—Laidlay Belton Lumber Co.; electric—Chambers Electric Co.

Sault Ste. Marie, Ont.

Hojen Bros., 206 Albert St. E., have the contract for plastering and Clement & Bennet, 287 Bruce St., the painting in connection with a $12,500 extension to bake shop of the Golden Grain Bakery. Findlay & Foulis, 527 Queen St. E. are the architects.

Simcoe, Ont.

Work is to start shortly for a $25,000 addition to the plant of City Dairy Co. Ltd., Toronto. Gore, Nasmith & Storrie, Toronto, are the engineers in charge of the work.

St. Jerome, Que.

Charles Larin, 2332 St. Denis St., Montreal, is the general contractor for a bank to be built for the Banque D'Hochelaga.

Toronto, Ont.

R. G. Kirby, 539 Yonge St., has the general contract in connection with the remodelling of Y. W. C. A. headquarters on McGill St., to cost $125,000. Molesworth, West & Secord, 43 Victoria St., are the architects; plumbing and heating—Ramsey & McIntosh, Ltd.; electric—Harry Alexander, Ltd.

The following sub-trades have been let on $12,000 auto parking station at 390 Richmond West; steel—McGregor & McIntyre Ltd: carpentry—S. Sherman, care architect, 336 Dundas W.; heating and sheet metal—Toronto Sheet Metal Works.

Excavation work has started for $175,000 office building corner Gerrard & Yonge Sts. for the Canada Life Assurance Co.; superintendent of buildings—W R. Dunlop, 42 King West; architects—Sproat & Rolph, 1162 Bay St.; general contractors—P. H. Secord & Sons Construction Co, Ltd.; excavation—Ontario Foundation & Engineering Co. Ltd; reinforcing steel—H. C. Lefroy Engineering Co. Ltd; plumbing and heating—Robt. Jordan, 37 Hazleton Ave.; electric—Salisbury Electric Co. Ltd.; steel sash—Architectural Bronze & Iron Works; ornamental and miscellaneous iron—McGregor & McIntyre, Ltd.; plastering—M. A. Farrelly Co.; roofing, painting, glazing, marble and tile work and mill work to be let by general contractors.

The following sub-trades have been let in connection with $40,000 office building at Queen E. and Connaught Ave.; millwork—Buyer's Door & Mfg. Co., Ltd.; glass and glazing—Metropolitan Glass Co. Ltd; marble, tile and terrazzo—Italian Mosaic & Tile Co. Ltd.; asphalt masting flooring—W. A. Moffatt, 86 Don Esplanade; structural steel—McGregor & McIntyre; ornamental iron and steel toilet partitions—Geo. B. Meadows Co. Ltd.; roofing and sheet metal—W. G. Edge Ltd.; plumbing, drains and steam heating—Sheppard & Abbott; electric—Toronto Electric Co.; steel sash—H. C. Lefroy Engineering Co; plastering—M. A. Farelly Co.; painting—Bavington Bros.

R. C. Dancy, 57 Kendal Ave., has the contract for plastering in connection with $40,000 addition to plant of the Ideal Bread Co. R. G. Kirby, 539 Yonge St., is the general contractor. Painting to be let.

Timmins, Ont.

Archibald & Holmes, 709 Yonge St., Toronto, have been awarded the contract for a $35,000 office building for the Hollinger Gold Mines. J. S. Archibald, 326 Beaver Hall Hill, Montreal, is the architect.

Vulcan, Alta.

Work is to start at once for a $7,300 skating and curling club. General contract has been awarded to Bennett-White Construction Co., Calgary, Alta. Jas. MacDonald, Calgary, is the architect.

Walkerville, Ont.

R. W. Featherdale, 119 Moy Ave., is the general contractor for an $8,000 store on Monmouth Rd., for John L. Stark, Moy Ave. Electric, plumbing and plastering to be let.

Residences

Birchcliffe, Ont.

The foundations are in for 1 pair residences costing $8,000 on west side Valhalla Blvd. Chas. Barnard, 93 Woodbine Ave., is the owner and builder. Plastering, painting, plumbing, heating and electric to be let.

The walls are going up for a $6,000 residence on west side Valhalla Blvd. H. Thrussell, 20 Valhalla Road, is the owner and builder. Tenders being received by owner on electric, plastering, plumbing, heating and painting.

Sammon Realty Co., 1228 Kingston Road, are the owners of a $5,000 residence being built on west side Kildonia Road. Electric, plastering, plumbing, heating and painting to be let.

Cooksville, Ont.

The excavating work has started for 4 residences to be built on Orchard Rd. costing $20,000. Miss R. A. Zimmerman is the owner, who buys material. Work is being done under direction of foreman, A. Bonhomme. No material purchased.

Erindale, Ont.

R. N. Irvine, 51 Castle Frank Road, Toronto, contemplates building 3 residences costing $20,000, on River Front.

Galt, Ont.

Bulk or separate tenders are being received till October 1 by the architect, Ray Hall, 25 Water St. N., Galt, Ont., in connection with the erection of a residence corner Brant Road and Salisbury Ave. Plans and specifications with architect.

Hamilton, Ont.

Joe Vickers, 35 Elm St., contemplates building 8 residences on Ottawa St. S. Roofing, plastering, painting, electric, plumbing and heating to be let.

Kitchener, Ont.

Ball Bros., 32 Simeon St., contemplate building 6 residences at $4,500 each, on Fairview Ave. Tenders are being received until October 10 for electric, painting, heating and plumbing.

Messrs. Ball Bros., 32 Simeon St., are the owners and general contractors of 2 residences, $4,000 each, being built on Fairview Ave. Painting, electric, heating and plumbing to be let by owner.

Levis, Que.

J. E. Dube, Perreault St., is the general contractor for repairs to residence of Jos. K. Laflamme, Fraser St., to cost $6,000.

London, Ont.

Jas. Neilson, London Jct., is the owner and general contractor of 10 residences to be built on Paul St., costing $25,000.

Harry Hayman, 848 Dufferin Ave., is the owner and general contractor of a $7,000 duplex residence at 845 Dufferin.

H. L. Sifton, 387 Grosvenor St., is the owner and general contractor of 2 residences to cost $7,000. 1½ stories, 24 x 24, red brick veneer construction.

Montreal, Que.

T. Monastesse, 804a St. Andre St., is the owner and builder of a $15,000 residence on Sherbrooke St. Masonry, roofing, electric, plumbing, heating, plastering, painting, millwork and hardwood flooring to be let.

L. Messier, 21 Pacific, is the owner and builder of 2 stores and residence on Blvd. Decarie, costing $14,000. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting, glazing and tiling to be let.

P. Garceau, 734 Berri St., is the owner and builder of a $9,000 residence on Mt. Royal, between Chambord and Delanaudiere. Masonry, roofing, plastering, heating, electric and plumbing to be let.

D. Monette, 1995 St. James St., is the owner and builder of 2 stores and 6 apartments costing $25,000 on St. James St. Mr. Favreau, care owner, is the architect. Owner wants tenders at once on plastering and painting.

R. Charbonneau, architect, 194 G. E. Cartier Square, is preparing plans for 3 flats to cost $12,000, for J. A. Groulx, 1073 St. Antoine St. Tenders will be called shortly.

Tenders are being received by the general contractor, A. Lefrancois, 123 Sanguinet, on foundations, brickwork, millwork, roofing, electric, plumbing, heating, plastering and painting in connection with a $9,000 cottage to be built on Beaubien St.

Ottawa, Ont.

Work is to start shortly on 5 residences, $5,000 each, on Renfrew Ave. Cowie & Moore, 414 Sunnyside, are the owners and general contractors.

Tenders are being received by the owner, D. Younghusband, 322 Cooper St., on electric, plumbing and heating for a $6,500 residence being built on Grove Ave. No closing date set.

Tenders are being received by the owner, H. Kerr, 84 Ossington, for electric, plumbing and heating in connection with a $5,000 residence being built on Willard Ave. No closing date set. Balance of work by day labor.

R. Christie, 107 Sunnyside Ave., is the owner and general contractor of a $6,000 residence being built on Sunnyside Ave.

Port Credit, Ont.

Ross Patchett is the owner of a $7,000 residence being built on Wellesley St. Mr. McKay is the general contractor. Painting, plumbing, heating and electric to be let.

M. Skinner is the owner and general contractor of a $6,000 residence on Mineola Rd. Painting, heating, plumbing and electric to be let.

Walls are going up for a $7,000 residence on Centre Road. Wm. Parr is the owner and general contractor. Painting, plumbing, heating and electric to be let.

St. Catharines, Ont.

Geo. Anderson has the general contract for a $6,000 residence being built on Russell Ave., for Sidney Dix, 3 Marquis St. Electric—A. B. Cudney, 22 Thomas St.

J. Allen, 145½ York St., contemplates building a duplex residence on Centre St. No materials purchased.

Sandwich, Ont.

Prince Bros., Windsor, Ont., are the owners and general contractors for a $14,000 duplex residence on Partington Ave. Painting, plastering, electric and plumbing to be let. No materials purchased.

Sarnia, Ont.

The walls are going up for an $8,000 residence on west side Brock St. W. C. Nelson, Royal Bank Bldg., Front St., will let contracts and buy materials.

Saskatoon, Sask.

The foundation is in for a $5,000 residence on University Drive. E. C. Inskip, 715 Lorne Ave., is the owner and builder

Fred Shoquist, 520—9th St. East, is the owner and builder of a $5,000 residence on Fifth Ave. 2 stories, frame and stucco construction.

Scarboro Twp., Ont.

Harry Brenner; 133 Walmer Road, is the owner of 4 residences being built near Ford Plant, and is asking for tenders on electric, plastering and painting. Also brick work (labor only).

Springfield, Ont.

Daniel G. Gillies is the owner and general contractor of a $5,000 residence; 2 stories, 23 x 25, brick construction.

Toronto, Ont.

S. H. Lumb, 31 Oakdene Crescent, is the owner and builder of 3 stores and apartments on north side Danforth near Caithness Ave. Heating, plastering, painting, plumbing and electric to be let.

Tenders will shortly be called on all trades in connection with 3 residences costing $6,000 each, to be built on Cloverdale Ave., near St. Clair West. Independent Builders Ltd., 2782 West Dundas, are the owners and builders. No material purchased.

A. A. Minaker, 5 King Edward Ave., contemplates building a store and apartment on the south side Gerrard East, near Coxwell.

Faxton & Duffield, 72 Hiawatha Rd., are the owners and builders of 1 pair residences on east side Woodfield, near Gerrard East, costing $7,500. Painting, plastering, electric, plumbing and heating to be let.

Work is to start shortly for 1 pair residences to cost $7,500 at 313-15 Woodfield Ave. G. Taylor, 183 Hiawatha Rd., is the owner and builder. Plastering, painting, plumbing, heating and electric to be let.

Work is to start shortly for 1 pair residences, $7,000 each, on Brookside Drive. Thos. Padfield, 52 Chisholm Ave., is the owner and builder. Plastering, painting, plumbing, heating and electric to be let.

The walls are going up for 1 pair residences costing $9,000 at 672-4 Sammon Ave. Jno. Thorne, 317 Woodbine Ave., is the owner and builder. Electric—Mr. Nichols, Logan Ave.; heating—Howard Furnace Co.

J. Hunt Stanford & Son, 67 Yonge Arcade, are preparing plans for 3 detached residences costing $40,000 on Orchard View Ave. D. Munro, 65 Lawton Blvd., is the owner and builder.

Work is to start shortly on 7 residences, $6,000 each, north side Strathmore near Woodmount Ave. W. H. Kerwin, 47 Keystone Ave., is the owner and builder. Plastering, painting, plumbing, heating and electric to be let

R. G. Sprague, 775 Coxwell Ave., contemplates building 3 residences on south side Queensdale, near Monarch Park Ave., to cost $5,000 each.

The foundations are going in for 3 detached bungalows to cost $16,500, on north side Wanless Ave. John R. Marshall, 179 Oakwood Ave., is the owner and builder. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects.

J. Hunt Stanford & Son, architects, 67 Yonge Arcade, have drawn plans for an $8,500 residence on south side Alexander Blvd. Geo. Clark, 133 Glengrove Ave. W., is the owner and builder.

R. G. Sprague, 775 Coxwell Ave., contemplates building 2 residences $5,000 each, on south side Poulton near Monarch Park Ave.

Plans are being prepared by J. Hunt Stanford & Son, architects, 67 Yonge St. Arcade, for an $8,500 residence on west side Weyburn Crescent for J. H. Wills, 512 Ossington Ave., owner and builder.

J. Hunt Stanford & Son, 67 Yonge St. Arcade, are preparing plans for 2 detached and 2 pair residences costing $24,000, on east side Springmount Ave., for G. E. Patton, 36 Regal Road, owner and builder.

Ernest A. Willis, 756 Dundas West, is the owner and builder of 3 bungalows, $3,000 each, east side Glengarry Ave. Electric, plastering, plumbing, heating and painting to be let by owner.

Kaplan & Sprachan, architects, 298 Dundas West, are preparing plans for a $125,000 apartment house, and want information on all materials.

J. E. Seaton, 243 Rushton Rd., is the owner and builder of 1 pair residences, $5,000 each, on Ossington Ave., at Bendon. Plastering, painting, electric and heating to be let.

J. E. McMillan, 164 Main St., is the owner and builder of 1 pair residences at 103-5 Pickering Ave., to cost $7,500. Heating, plumbing, plastering, painting and electric to be let.

Work is to start shortly on 2 residences, $6,500 each, at 140-2 Willard Ave. Jno. Joliffe, 90 Willard Ave., is the owner and builder and employs regular staff and buys material as required.

The foundations are going in for 1 pair residences costing $9,000 on south east corner Jedburg Rd. and Brookdale Ave. Rogers & Levins, 121 MacDonnell Ave., are the owners and builders. Painting, plastering, electric, plumbing and heating to be let. Masonry, day labor, Carpentry, day labor and owners.

Work is to start this year on 3 pair residences costing $18,000 on north side Milverton Blvd., near Woodington Ave. Plumbing, heating, plastering, painting and electric to be let.

Woodhouse & Dickinson, 2537 Danforth Ave., are the owners and builders of 1 pair residences on north side Milverton Blvd., near Woodington Ave. to cost $7,000. Plumbing, heating, plastering, painting and electric to be let.

Johnson & Mitchell, 34 Baltic Ave., are the owners and builders of 1 pair residences on east side Roseheath near Danforth Ave., to cost $7,000. Electric, plastering, heating and painting to be let.

Trenton, Ont.

Walker & Gibson, architects, 82 King East, Toronto, are preparing plans for a $7,000 residence for S. B. McClung & Co., Dundas St., Trenton.

Waterloo, Ont.

Ellert Bros., Park Ave., are the owners and general contractors of 2 residences being built on Charles St., at $5,000 each. Heating, electric, painting and plumbing to be let by owner.

Winnipeg, Man.

L. Heaney, 398 Furby St., is the owner and builder of 2 residences on

(Continued on page 49)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Grading

Sealed tenders will be received by Mr. J. L. Carter, Chairman, Guelph Suburban Road Commission; 20 Powell St. East, Guelph, Ont., up to noon on

Tuesday, October 2nd, 1923,

for grading suburban road No. 1 near Fosters' at the Townline of Guelph and Puslinch Twps., about 1670 cu. yds.

For plans and other information, apply to the Chairman or to the Engineers.

A. W. CONNOR & Co.,
34 Victoria St., Toronto.

39

TENDERS

TOWNSHIP OF TECK

The Corporation of the Township of Teck are asking for Tenders on the Installation of an Electric Lighting Plant for the Townsite of Swastika. Tenders close

October 6th, 1923,

The lowest or any tender not necessarily accepted.

Particulars may be had by addressing

MALCOLM CAMPBELL,
Kirkland Lake, Ont.

39-40

Hydro-Electric Power Commission

Tender for Excavation of a Tailrace Channel at Dam No. 9 on the Trent River

Sealed tenders for the Excavation of a Tailrace Channel in rock will be received by the Hydro-Electric Power Commission until 4.00 P. M.,

October 15th, 1923,

The work involves approximately 20,000 cu. yds. of rock excavation, disposal and fill.

Instructions to Bidders, Specifications, Drawings, Form of Tender, and Schedule of quantities, may be obtained at the office of the Commission, 190 University Avenue, Toronto, on and after September 24th., on deposit of a marked cheque for $15.00, which deposit will be returned upon receipt of a bonafide tender or upon the return in good condition of all plans and documents issued.

Tenders must be accompanied by an accepted cheque for $2,000.00 payable to the order of the Hydro Electric Power Commission, which cheque will be retained by the Commission until the contract is executed.

Tenders shall be enclosed in a sealed envelope, marked "Tender for Excavation of Tailrace Channel at Dam No. 9 Development" and be addressed to Sir Adam Beck, Chairman Hydro-Electric Power Commission of Ontario.

(Sgd.) W. W. POPE,
Secretary.

39

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Township of Sandwich East

Tender for Watermain

Sealed tenders plainly marked as to contents will be received up to 6 P.M.

Monday, October 1st, 1923,

for the supply and laying of approximately 19,562 feet or 6 inch Class "B" Cast Iron Watermain and necessary private service connections on Tecumseh Road in the Township of Sandwich East.

Plans and specifications may be seen and forms of tender obtained at the office of R. W. Code, C.E., 116 Chatham St. West, Windsor, Ont.

The lowest or any tender need not necessarily be accepted.

A marked cheque of $2000.00 made payable to the Treasurer of the Township of Sandwich East, shall accompany each tender.

FRANK BELLPERCHE,
Clerk of the Twp. of Sandwich East.

39

Sealed tenders addressed to the undersigned, and endorsed "Tender for East pier of Eastern Channel, Toronto Harbour, Ont.," will be received at this office until 12 o'clock noon,

Thursday, October 4th, 1923

for the reconstruction of 478 feet of the superstructure of the East pier of the Eastern Channel to Toronto Harbour, Toronto, York County, Ontario.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, and at the office of the District Engineer, Equity Building, Toronto, York County, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa September 13, 1923.

38-39

Town of Newmarket

TENDERS for Laying Watermains

Sealed tenders, marked and addressed to the Clerk, will be received until 5 o'clock,

Monday, October 1st, 1923,

for laying approximately:-

3,570 lin. ft. of 4" pipe.
4,440 lin. ft. of 6" pipe.

in the Town of Newmarket.

Plans and specifications may be seen, and form of tender received at the offices of the Town Clerk or Engineers.

W. W. CANE, Mayor.
P. J. ANDERSON, Clerk.

JAMES, PROCTOR & REDFERN, LIMITED,
Consulting Engineers,
36 Toronto Street,
TORONTO.

39

Silica Brick Plant for Sale

Apply for particulars to The Schultz Brothers Co. Limited, Brantford. 38-39

For Sale

One 2" Goold, Shapley & Muir Gasoline driven plunger type pump in good condition. The Schultz Brothers Co. Limited, Brantford.

38-39

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

For Sale

Subject to Prior Sale

Approximately 200,000 feet of new 2 x 4 Spruce Lumber. Dressed four sides, chamfered two edged. Suitable for factory floor. We are open to receive offers for the whole or part. The Goodyear Tire & Rubber Co. Ltd., By-product Department. New Toronto, Ont. 38-41

For Sale

Model 28—Marion Steam Shovel with clamshell attachment.
1—No. 2 Mitchell Jaw Crusher (new)
Several screen sections, 48" standard Austin screen.
1—2½" Centrifugal Pump
1—60 H.P. Locomotive type boiler.
1 60′—Barber Greene Portable Conveyor.

Above equipment may be seen at our quarry at Hagersville, Ontario.

Hagersville Quarries Limited, 4 Flora Street, St. Thomas, Ont. 37-39

Sealed tenders addressed to the undersigned, and endorsed, "Tender for addition to Dormitory, R. M. C. Kingston, Ont.," will be received until 12 o'clock noon,

Tuesday, October 16, 1923,

for the construction of an addition to Northern end of present Dormitory Bldg., Royal Military College, Kingston, Ont.

Plans and specifications can be seen and forms of tender obtained at the offices of the chief Architect, Department of Public Works, Ottawa, the Resident Architect, General Post Office, Toronto; Resident Architect, Department of Public Works, Merchants Bank Building, Kingston, Ont., and the Asst. Mechanical Engineer, Dominion Public Works Bldg., Place Royale, Montreal, P.Q.

Blue prints can be obtained at the office of the Chief Architect, Department of Public Works, by depositing an accepted bank cheque for the sum of $50.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 24, 1923. 39-40

FOR SALE

No. 17 Firebox Steam Boiler Low Pressure, Ontario Government Regulation Certificate.

TAYLOR-FORBES CO. LTD.,
1088 King St. West,
39 Toronto, Ont.

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6' 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3 000 pair Blankets.
Cookery Outfit.

Apply to Box 375, Contract Record Toronto.
37-38-39

BUILDING CONSTRUCTION SUPERINTENDENT about to complete present job, now open for engagement. Box 385, Contract Record, Toronto. 39

WANTED—LIVE, ENERGETIC YOUNG MAN for city engineer's office, until Xmas, must be good instrument man, draftsman, and quick at figures. Reply, giving experience, age, etc., to City Manager, Chatham, Ontario. 39

SITUATION WANTED—CONSTRUCTION SUERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-42

Tenders Wanted

Lathing and plastering, Felt and gravel roofing for Newmarket Public School.
Plans at Works.

W. E. RICHARDSON, Contractor,
39 Newmarket, Ont.

Residences

(Continued from page 47)

east side Garfield near Wolseley, to cost $4,000 each. Sheet metal, electric, heating, plastering and painting not yet let.

CONTRACTS AWARDED

Cooksville, Ont.

Hawkins & Kelly have the contract for masonry work for 4 residences costing $25,000. All other contracts to be let by the architect, J. A. Thatcher, 37 Cowan Ave., Toronto.

Hamilton, Ont.

J. Poag & Son, 105 Clyde Block, are the general contractors for a $6,000 residence being built at 843 Main St. E., for D. Ferguson.

Kitchener, Ont.

The walls are going up for 2 residences on Fairview Ave., $5,000 each. Ball Bros., 32 Simeon St., are the owners and general contractors. Painting—W. Scott, 236 Samuel St.; heating and plumbing—Hy. Neeb, Ontario St. S.

P. Bogdon, Wellington St., has the general contract for a $7,000 apartment house on Water St. North, for Car Ross, Waterloo, Ont.

London, Ont.

M. J. Morrison, Dundas St., is the general contractor for 2 residences on Adelaide St., costing $9,000, for Kilpatrick Bros., 602 Dundas St.

Moncton, N. B.

Le Blanc & Babineau, 21 King St., are the general contractors for a $5,500 residence on John St. from M. A. Wilcox, 312 Robinson St. Electric and plumbing—J. W. McCarthy, St. George St.

R. W. Benjamin, Fourth St., is the owner and builder of an $8,000 residence on Lime St. W. C. Barnes, Wyse Bldg., is the architect. General contractor—Desire Cormier, Sunny Brae, N. B. heating and electric—Moncton Plumbing & Supply Co.

Montreal, Que.

Denis Construction Co. are the general contractors for 2 residences to cost $24,000 on Mt. Pleasant near Trafalgar, for J. C. Rancourt. owner, 3820 St. Laurent. No materials purchased. General contractor buys. Sub-trades to be let

Nard Construction Co., are the owners and builders of a $150,000 apartment house on Dorchester St.; millwork—Daniel Cream, 953 St. James St.; electric—W. Staines, 527 Cadieux; plumbing and heating—Conroy Bros.; plastering—H. Peppin, 82 Gauthier; painting and glazing—C. Perras, 1162 Henri Julien; tiling—Pizzagalli's Terrazzo Tile Mfg. Co.; ornamental iron—Silverman Iron Works.

L. Cloutier, 3702 Benoni St., is the owner and builder of 2 residences on Benoni St., costing $18,000. Daniel Kochenburger, 2739 At. Hubert, has the contract for roofing and plumbing. Masonry by day labor.

F. Wilkinson, 61 Oxford St., is the general contractor for an $8,000 residence on Earnscliffe Ave., for J. E. Wilkinson, 745B Champagneur St. Masonry, roofing, heating, plumbing, plastering and electric to be let.

D. Desjardins, 1420 St. Andrew, has the contract for masonry work and Mr. Laplante, care 3680 St. Hubert, the plastering, in connection with a $12,000 residence being built on Chateaubriand.

A. Gauthier, 223 Chambord, has the contract for masonry, and D. Pare, 1546 Papineau, contract for plastering in connection with a $10,000 residence on Boyer St. Painting and glazing to be let.

Vermette & Noel, 2140 Rosemount Blvd., have the general contract for a $12,000 residence (5 flats) on Esplanade Ave., and want prices on all materials and tenders on all sub-trades. H. Lachance, St. Denis St., is doing the excavation work and foundations.

Port Credit, Ont.

Wm. Hern, 592 Sherbourne St., Toronto, is the owner and general contractor of 6 stores and apartments on Main St., costing $30,000. Roofing, plumbing and heating—J. McMahon, Port Credit; electric—G. Lee, 6 Howard St., Toronto; plastering—Campbell & Dennison, Port Credit; glazing—John W. Scott, Port Credit. Painting day labor. Owner supplies material.

Preston, Ont.

The foundations are in for a $9,000 residence being built for Dr. M. E. Gorman. Architect—Ray Hall, 25 Water St. N. General contractor—Geo. Mather, Preston. No materials purchased.

St. Catharines, Ont.

Hall Bros., King St., have the contract for sheet metal work on 10 to 18 residences being built by Allan Gogo, 9 Facer St. Electric, plastering and painting to be let.

Sandwich, Ont.

Dave Marshall, 345 Lincoln Rd., has the contract for plumbing and heating in connection with a $6,500 store and flat being built on Elsmere Ave.

Sault Ste. Marie, Ont.

The walls are now going up for a $35,000 Nurses Home "Gibson Memorial." J. J. Fitzpatrick, 127 Church St., is the general contractor; heating—Dunseath & McLary, Spring St. General contractor buys material.

Toronto, Ont.

Herbert E. Warrington, 222 Woodbine Ave., is the owner and builder of 18 residences on Orchard Park Blvd., to cost $5,600 each. Masonry—Wm. Pugh, 127 Gamble Ave. Carpentry day labor. No material purchased.

Dominion Realty Co., Bank of Commerce Bldg., are the owners of 2 stores and apartments being built at 4 Bloor West, costing $10,000 each. Plumbing—W. H. Booth, 92½ Avenue Rd.; plastering—Andrew Petrie, 457 Roxton Road. Electric and heating to be let.

Jno. Thorne, 317 Woodbine Ave., is the owner and builder of 1 pair residences at 680-2 Sammon Ave., to cost $8,000. Heating—Howard Furnace Co.; electric — Mr. Nichols, Logan Ave.; painting—by owner.

Jackson & Mitchell, 853 Logan Ave., are the owners and builders of 1 pair residences at 683-5 Strathmore Blvd., costing $7,000. Excavation is being done by A. & J. Abbott, 74 Balfour Ave. Painting, plastering, electric, plumbing and heating to be let.

The walls are going up for 1 pair residences costing $8,000 at 504-6 Strathmore Blvd. Day & Hill, 480 Strathmore Blvd., are the owners and builders. Plumbing—G. W. Ockenden, 28 Merrill Ave.; electric—H. Thomas, 490 Kingston Rd.; plastering—F. Harrington, 44 West Lynn Ave.; painting—Yorke Bros., 90 Alexander St.

W. Grant, 2369 Gerrard East, has the contract for excavation work in connection with 1 pair residences costing $8,000, on east side Scarboro Rd., near Kingston Rd., for F. Smart, 122 Bingham Ave.

Sub-trades as follows have been let on 2 pair residences costing $9,000, west side Woodfield near Queen East; electric—Taylor Bros.; heating—Mason & Allen; plumbing—R. J. Ritchie, 851 Logan Ave.; plastering — Wickin & Page; painting—A. M. Simmons, 612 Jones Ave.

The following sub-trades have been let on 1 pair residences, $6,000 each, being built on north side Rhyl, near Haslett Ave.: electric—Elect Electric Co.; heating—Chas. Frampton, 169 Greenwood; plumbing—H. Cook, 69 Sprucehill Road; plastering—H. Hill, 16 Lawlor Ave.

The following sub-trades have been let on 1 pair residences costing $8,000, on south side Fourth Ave.: painting—A. E. Rance, 98 Hiawatha Rd.; plumbing—G. Oakenden, 997 Woodbine Ave.; heating—Howard Furnace Co., 881 Yonge St.; plastering—Wright & Gaunt, 108 Montrose Ave.

The walls are going up for 1 pair residences on north side Riverdale Ave., near Carlaw, to cost $8,000; plumbing—W. J. Stratton, 314 Lee Ave.; heating—Howard Furnace Co.; electric—Wm. Gibson, 156 Beech Ave.

The following sub-trades have been let on 1 pair residences costing $8,000 being built east side Glebemount Ave., near Sammon Ave.: plumbing—W. Hoad, 24 Norway Ave.; heating—Howard Furnace Co.; electric—B. Byford, 5 Bushel Ave. Plastering and painting by day labor.

Vancouver, B. C.

Work is to start at once on a $500,000 apartment block north east corner Georgia and Hornby Sts. Smith Bros. & Wilson, 711 Credit Foncier Bldg., are the general contractors.

Westmount, Que.

The following sub-trades have been let on apartment house being built north east corner St. Catherine & Melville: art stone—Canadian Hydro Stone Ltd.; roofing—Dominion Sheet Metal Works; electric — W. Staines, 587 Cadieux; plumbing and heating—Conroy Bros.

W. A. Handfield, 11 Place D'Armes, is the owner of an apartment house being built south east corner St Catherine and Lewis; exxcavation, foundations and fireproof flooring—Munn & Shea, Ltd.; carpentry, brickwork and terra cotta—Duranceau & Duranceau; incinerators — Spencer Heater Co. of Canada, Ltd.; roofing, plumbing and heating—E. Tremlbay Enrg.; plastering—Girard & Girard. Marble, electric, painting, etc., to be let. Owner wants prices on lumber direct from mill, on large quantity B.C. fir, oak, etc. Also on art stone and catalogues on mail chutes.

Windsor, Ont.

Wm. Herridge, 1544 York St., is the owner and general contractor of a $12,000, 4 family apartment on York St. Carpentry, electric, plumbing, plastering and painting to be let.

Railroads, Bridges and Wharves

Port-Au-Persil, Que.

Tenders are being received till October 8 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of a wharf. Plans and specifications with Dept. offices of Dist. Engineers, Post Office Bldg., Quebec, Que., Shaughnessy Bldg., Montreal, and at Post Office, Port-Au-Persil, Que.

Renata, B. C.

Tenders will be received till October 11 by the Dept. of Public Works, Ottawa, Ont., through the secretary, R. C. Desrochers, for the construction of a public wharf at Renata. Plans and specifications with the Dept. of Public Works, Ottawa, Ont.

St. Michel D'Yamaska, Que.

Tenders are being received till October 1 by the town council, through the secretary, N. St. Germain, Yamaska East, for the construction of a reinforced concrete bridge. Plans and specifications with secretary-treasurer and engineer, Ivan E. Vallee, Dept. of Public Works, Parliament Bldgs., Quebec, Que.

St. Pierre Les Becquets, Que.

Tenders are being received till October 3 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for construction of wharf. Plans and specifications at Dept. offices of district engineers, Post Office Bldg., Three Rivers, Que., Post Office Bldg., Quebec, Que., Shaughnessy Bldg., Montreal, and Post Office, St. Pierre les Becquets.

Sault Ste. Marie, Ont.

Spanish River Pulp & Paper Mills, Ltd., are having plans drawn for a $300,000 slip and wharves at opposite end of John St. and mouth of Fort Creek.

CONTRACTS AWARDED

Dover Twp., Ont.

The township council has awarded the contract for a $5,500 bridge to W. E. Lamb, Wallaceburg, Ont. General contractor buys material. W. G. McGregor, Chatham, Ont., is the engineer in charge.

Hardwood Ridge, N. B.

McMulkin & Fox, Chipman, N. B., have been awarded the general contract by the Canadian National Railways, for a railway spur line (5 miles) costing $100,000.

North York Twp., Ont.

The township council has awarded the contract for a bridge to John Ritchie, Beamsville, Ont., at $6,031.

North Vancouver, B. C.

Northern Construction Co., and Gen. J. W. Stewart, 736 Granville St., Vancouver, have the general contract for a $1,450,000 bridge to span 2nd Narrows. A. D. Swan, Montreal, Que., is the architect.

St. John, N. B.

The city council has awarded the contract for reinforced concrete bridge to J. A. Grant & Co. at $16,000. G. G. Hare is the engineer in charge. General contractor in market for cement.

Sorel, Que.

Jackson Construction Co., Pierreville, Que., have been awarded the general contract for the construction of high level wharf, at $113,800.

Power Plants, Electricity and Telephones

Clinton, Ont.

The Hydro Electric Power Commission of Ontario contemplate an extension to hydro lines from Clinton to Bayfield, Ont.

CONTRACTS AWARDED

Hopewell, N. S.

W. I. Snook, care N. S. Power Commission, Halifax, has been awarded the contract for a 66,000 volt single circuit transmission line from Hopewell to Stellarton, N. S.

St. Jerome, Que.

J. C. Wilson, Ltd., St. Jerome, Que., have awarded the general contract for a transmission line from St. Jerome to Lachute, Que., to the Canadian Comstock Co., Ltd., Montreal. Messrs. Beaubien, Busfield & Co., Montreal, are the engineers in charge of the work.

Wm. I. Bishop, Ltd., Montreal, are the general contractors for a dam and power house on the North River to be built for J. C. Wilson, Ltd., St. Jerome, Que.

Stellarton, N. S.

The Nova Scotia Power Commission, Halifax, have awarded the contract for a 13,200 volt transmission line from Stellarton to Pictou, to W. I. Snook, care N. S. Power Commission, Halifax.

Miscellaneous

CONTRACTS AWARDED

Cheti Camp, N. S.

The contract for dredging of Eastern Harbor has been awarded to the Glasgow Dredging Co., New Glasgow, at $40,200.

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Late News

Banfield, B. C.

Tenders will be received by R. C. Desrochers, secretary of the Dominion Department of Public Works, Ottawa, until October 11, for the reconstruction of the wharf on east side of harbor at Banfield, Barclay Sound. Plans and specifications at the department, Ottawa.

Bentinck Island, B. C.

Dominion Department of Public Works, Ottawa, through the secretary, R. C. Desrochers, are calling for tenders until October 12 for the construction of several huts and buildings at the Lazaretto, Bentinck Island. Plans and specifications with the Department at Ottawa.

Forest, Ont.

Tenders are being received until October 1 for construction of drain on Albert St. Clerk, W. J. English.

Jonquiere, Que.

The town council, through clerk, J. M. Lacroix, are receiving tenders until October 1, for turbines, 1,500 and 1,800 h.p., in connection with the $75,000 extension to the local hydro-electric power development. Plans and specifications with the engineer, J. F. Grenon, Chicoutimi, P. Q.

London, Ont.

C. A. Vanderlane, 1023 Kink St., architectural designer, contractor and builder would like to receive prices, samples and catalogues on all building materials.

Montreal, P. Q.

J. Besner, 3368 Christophe Colomb St. is building a $9,000 residence on Christophe Colomb St. and will let the following trades: roofing, electrical work, plumbing and heating and plastering.

W. Chartrand, Hogan St., is building an $8,000 residence on Hogan St., between Ontario & Rouen and will sub-let the brickwork, roofing, electric, plumbing and plastering trades.

Ottawa, Ont.

Tenders are being received by G. D. Murphy, 118 Third Ave., until October 3, for plastering, electric, plumbing and heating trades in connection with $9,000 residence he is building at Central Terrace.

Port Elgin, N. B.

Work has just been commenced on power plant and electric plant for the village of Port Elgin. The building will cost $1,000 and equipment $9,000.

Point Grey, B. C.

Tenders will be received by Patrick Philip, engineer, Provincial Department of Public Works, Victoria, B. C., until September 29, for grading roads and sidewalks ready for paving operations as part of a general town planning scheme in connection with government lands in vicinity of Point Grey University. The estimated cost of this work is $40,000.

Quebec, P. Q.

Plans are being prepared by Tanguay & Chenevert, 20½ D'Aiguillon St., for a 4-storey addition, 50 x 68 ft., to St. Patrick school on de Salaberry St., for the Quebec School Board. Tenders will be called in about two weeks. This addition will be a teachers' residence.

H. Bergeron, 305 Grande Ave., is building a 3-family residence on St. Cyrille St., costing $9,500. Work is being done by day labor.

Sandwich, Ont.

A. Jacomine, London & Randolph Sts., is preparing plans for a $50,000 apartment building which he plans to erect here.

Shifton Township, P. Q.

The township council have commenced on a program of provincial gravel road construction in the township, to cost $45,120.59.

South Vancouver, B. C.

The rebuilding of mill and creosoting plant on River Road, for the Dominion Creosoting & Lumber Co., will be commenced shortly. The work will be done by day labor at an estimated cost of $250,000.

Strathroy, Ont.

Plans are being revised for the $25,000 addition to the local hospital. Tenders will probably be called in two or three weeks' time. Architect, W. G. Murray, Dominion Savings Bldg., London, Ont.

Toronto, Ont.

The electric, heating, plumbing, plastering and painting trades in connection with the erection of 1 pair and 1 single residences being erected on Prescott Ave., by E. J Colborne, 186 Silverthorne Ave., will be let.

Trent River, Ont.

Tenders are being received until October 15, by the Hydro-electric Power Commission of Ontario, for approximately 29,000 cu. yds of rock excavation, disposal and fill of tailrace channel at Dam No. 9. Plans and specifications at 190 University Ave., Toronto.

Windsor, Ont.

The city council is contemplating the paving of an alley from Montmorency St. to Cataraqua St. Clerk M. A. Dickenson.

Winnipeg, Man.

Work has just commenced on an acetylene and compressor plant on the south side of McDermott Ave., near Red River, for the Auto Lite Gas Co., 456 Lipton St. The building will be 100 x 55 ft., of brick and hollow tile construction. General contractor W. J. Palmer, 336 Machray Ave., Winnipeg, wants prices at once on all sub-trades.

CONTRACTS AWARDED

Belleville, Ont.

John Lewis & Co., 265 Front St., has the plumbing and heating contract for $75,000 theatre and store building at 353 Front St., for J. C. McCarthy, 232 Front St. The electrical contract has been let to the local Hydro Commission.

Brampton, Ont.

Horton & Smith, 32 Resslyn Ave. N., Hamilton, have been mentioned as probable general contractors on the construction of sunday school building for Grace Methodist Church here. Architects, Horwood & White, 229 Yonge St., Toronto. The building will be 2 storeys, 83 by 65, of steel and brick construction.

Wright Bros., Ltd., 1425 Yonge St., Toronto, have secured the plumbing and heating contract, and Mr. McLean, Brampton, the painting and glazing contract in connection with the $25,000 residence being built at Brampton by Messrs. Horton & Smith, 32 Rosslyn Ave., N., Hamilton. Waters & Wilkes, 43 Scott St., Toronto, are the architects.

Cobourg, Ont.

Contract for dredging at Cobourg has been awarded by the Dominion Department of Public Works to the Frontenac Dredging Co. Ltd., at $21,700. Secretary-treasurer of this company is Mr. R.

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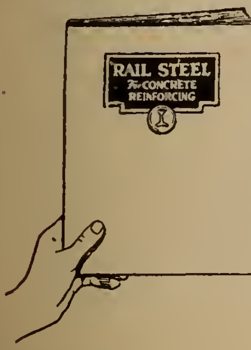

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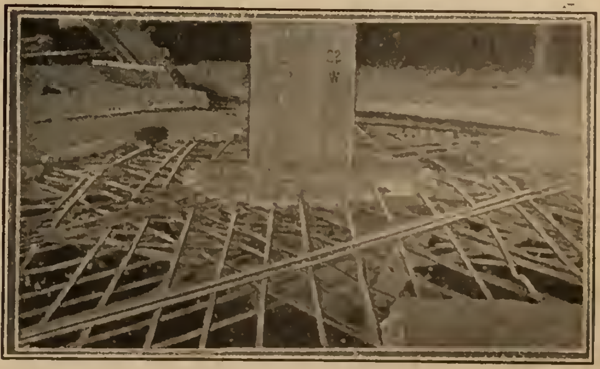

Arrangement and condition of bars around column

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Hamilton, Ont.
A. Cope & Son are mentioned as the probable contractors on the laying of Sterling St. sewer, from Witton St. to King St., at a cost of $32,755. The probable contractor on the work to be done by tunnel method is the Webster Construction Co. Ltd., 134 Darling St., London, at $4,800 This latter work comprises the section on Sterling St. from Witton Rd. to the Ravine. City Engineer, W. L. McFaul.

New Glasgow, N. S.
The Fraser Paving Co. have been awarded contract for laying of 950 lin. ft. of 5 ft. sidewalk on McLean St, and 1,400 lin. ft. of sidewalks on Forber St., at a figure of 24½ cents per sq. ft.

Niagara Falls, Ont.
J. H. McKnight Construction Co. Ltd., 88 St. David St., Toronto, have the general contract for 2,900 ft. of sewer excavation here, at a figure of 82 cents per ft.

General contract for the erection of ice arena for the Niagara Falls Arena Ltd., on Victoria Ave., has been let to Gardner Construction Co. Ltd., 22 Cross St, Welland, Ont., at $52,000. The building will be one storey, 140 x 280, of stucco and concrete construction.

Sarnia, Ont.
The Sarnia Plumbing & Heating Co., George St., have been awarded the plumbing and heating contract in connection with $8,000 residence being built on Brock St., by Miller & Ellis, 258 Bright St., for Capt. A. E. McGregor, 226 N. Vidal St.

Sydney, N. S.
J. Rowsell, 859 George St., has the contract for the erection of the following residences in Sydney: frame residence for Mr. Geo. Macley, on Rigby Rd., to cost $6,000; frame residence for G. M. Nicole, St. Peter's Rd., to cost $6,000 and frame residence for Rev. D. N. McDonald, Ankerville St., to cost $6,500.

Tecumseh, Ont.
The plumbing and heating contract in connection with 6-room addition to the Tecumseh Separate School has been let to Clarence Petz, at $7,787.97. Architect, Gilbert J. P. Jacques, 3 Ouellette, Ave., Windsor.

Toronto, Ont.
The following sub-trades have been awarded in connection with the $150,000 building program of the Toronto Transportation Commission consisting of subsidiary buildings; marble, tile and terrazzo, Italian Mosiac & Marble Co., 442 King W., roofing and sheet metal, A. W. Carmichael Ltd., 918 Palmerston Ave.; electrical, Richardson & Cross, 81 King St. E., heating and plumbing, B. J. Miller & Co., 550 Bathurst St.; plastering, W. H. Hynes & Co. Ltd., 858 Dupont St. Glazing and painting contracts to be let. General contractor is Sullivan & Fried, 81 Victoria St.

T. H. Hancock, 1372 Bloor St. W., has been awarded contract for mill work and McGregor & McIntyre Ltd., 1139 Shaw St, contract for miscellaneous ironwork in connection with the 3-storey dye house and mfg. bldg. for the Toronto Carpet Co., at 1179 King St. W. Architect, Wm. Steel & Son, Ryrie Bldg.

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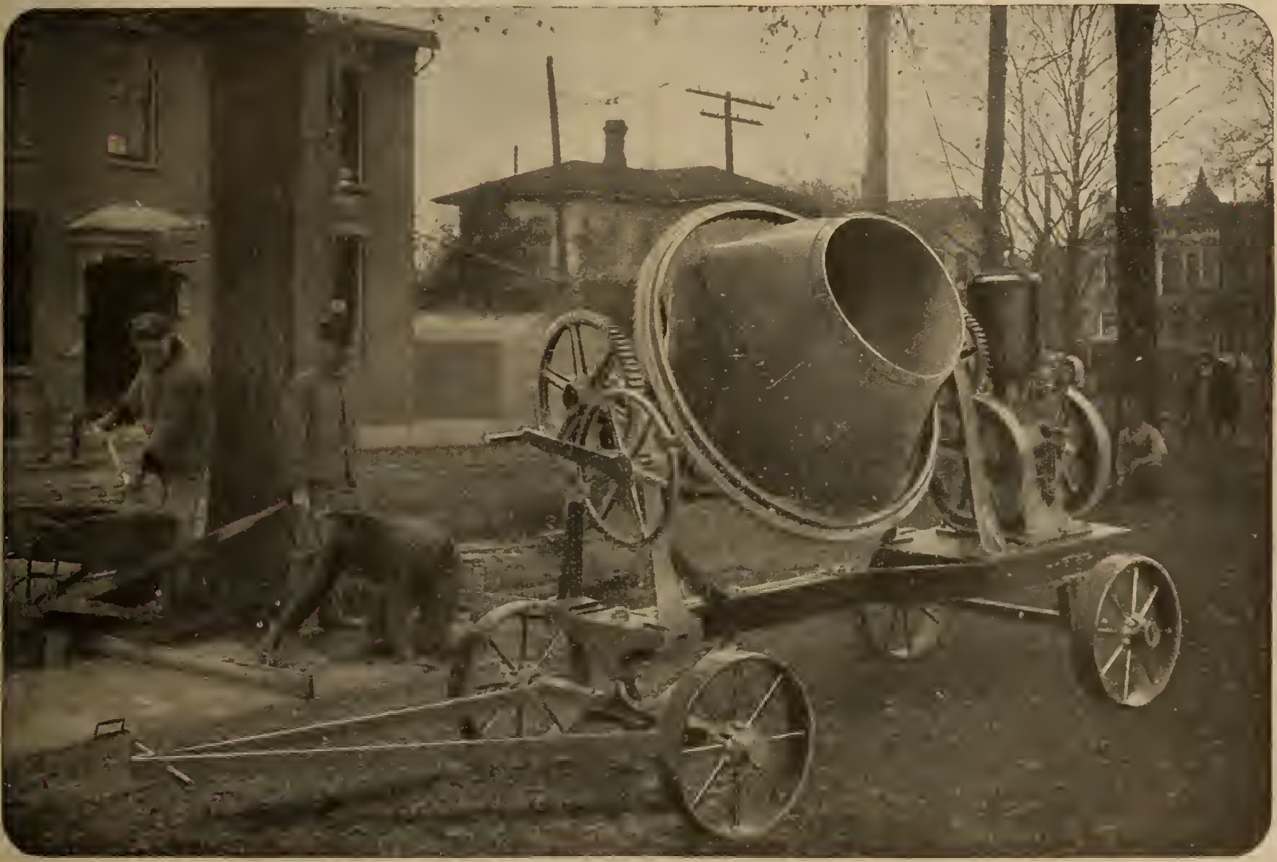

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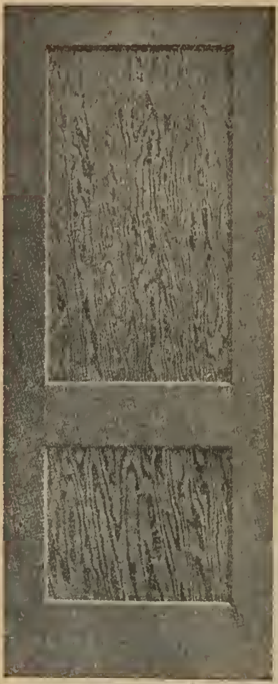

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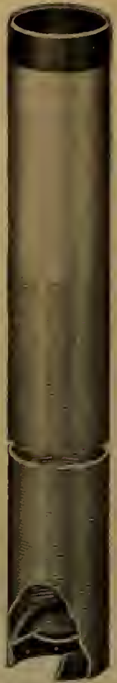

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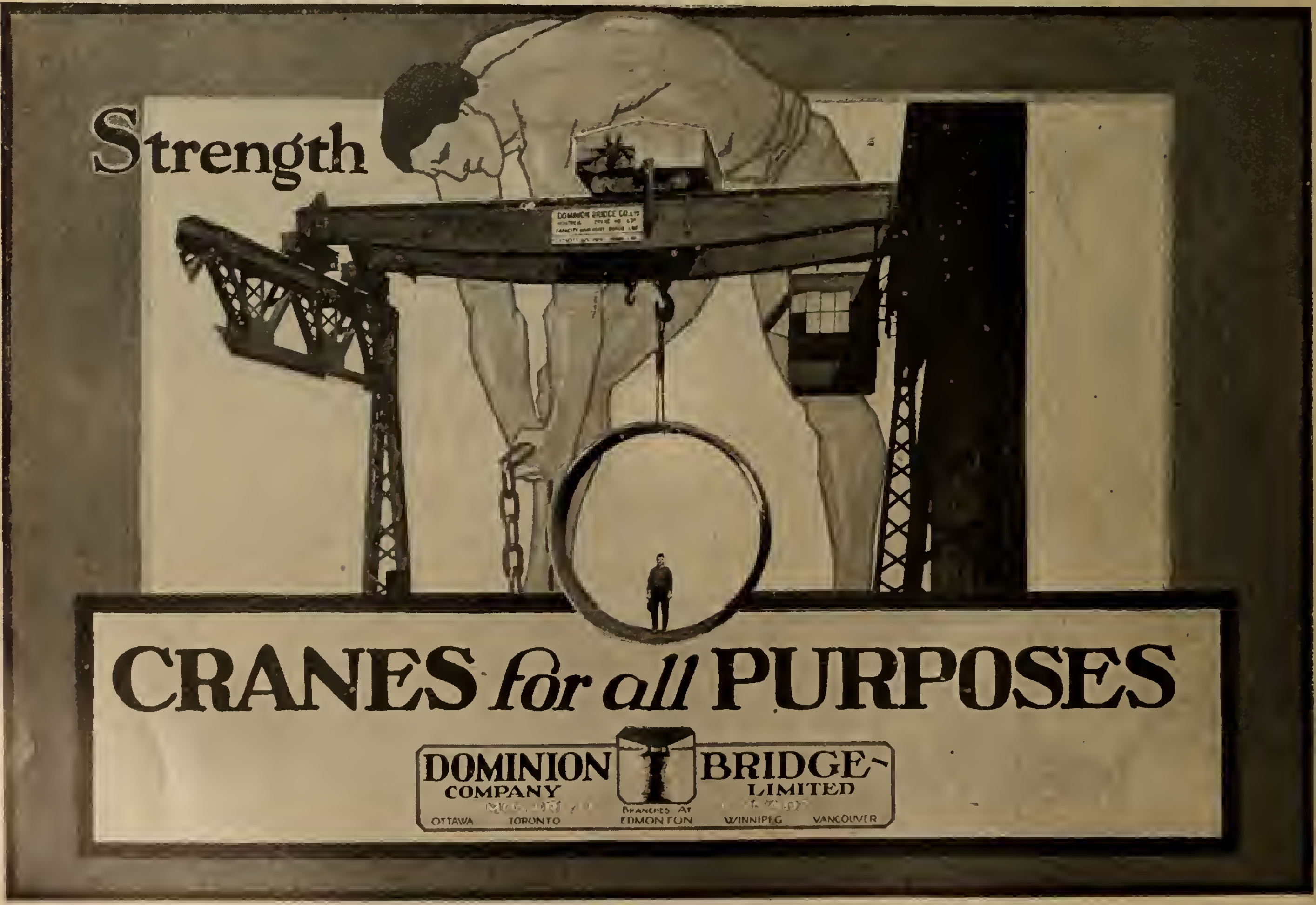
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CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.10 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
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Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
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Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	12.60	
Lath, M. R. spruce	per M.	9.50	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.50	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.
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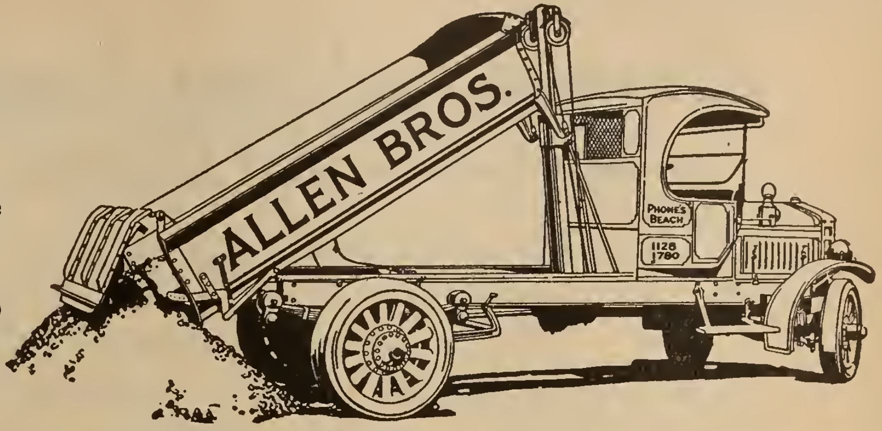

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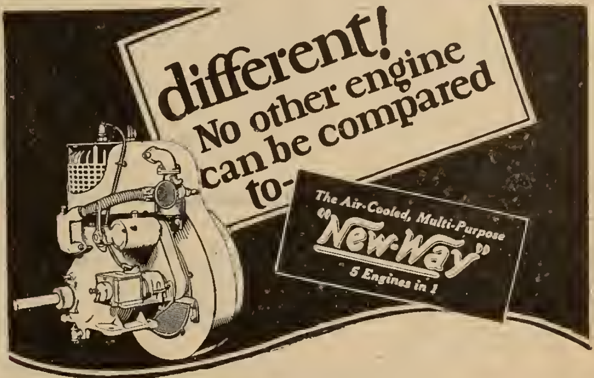

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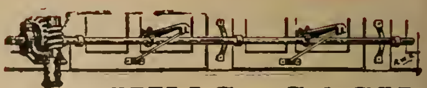

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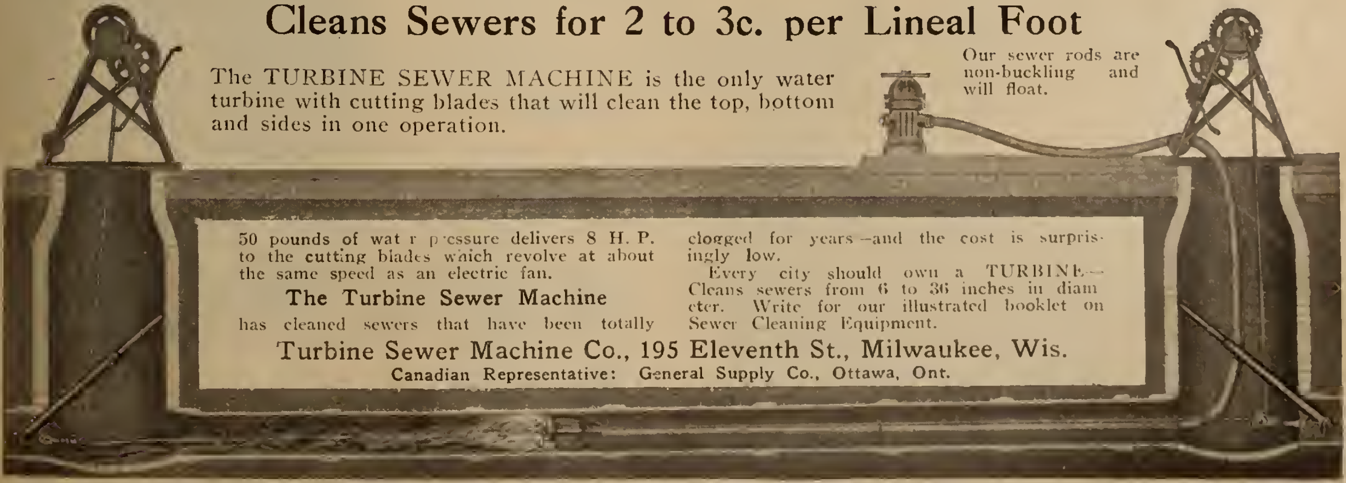

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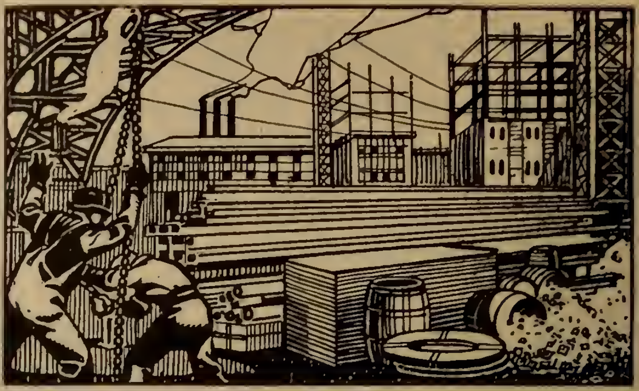

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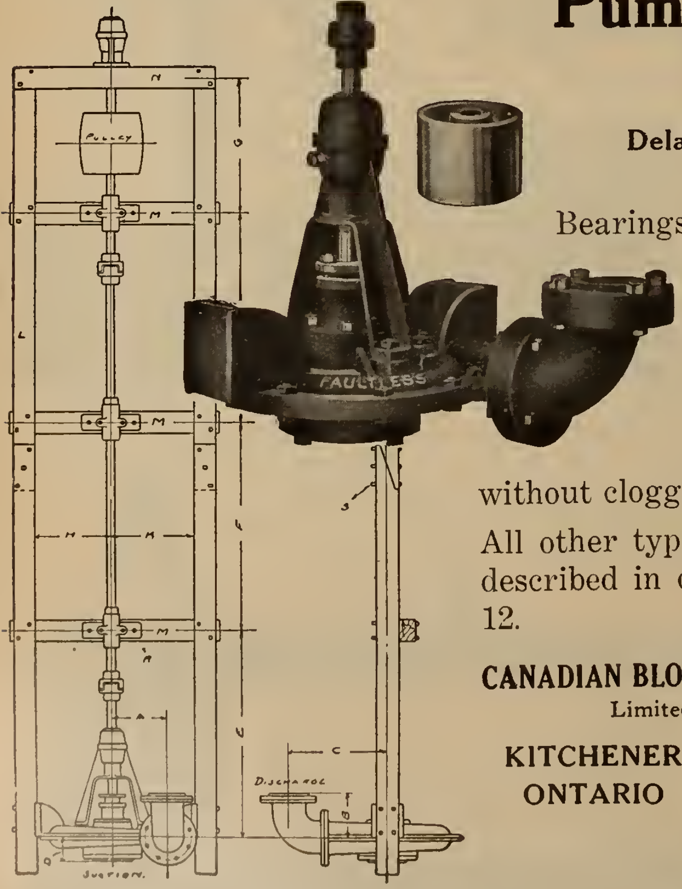

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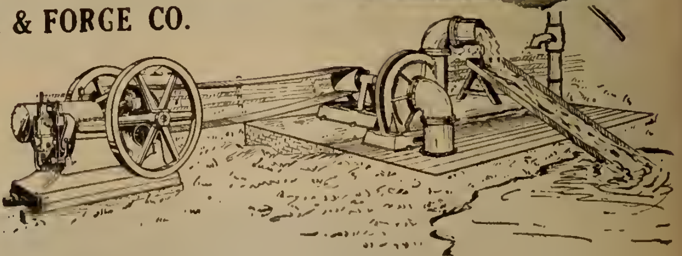

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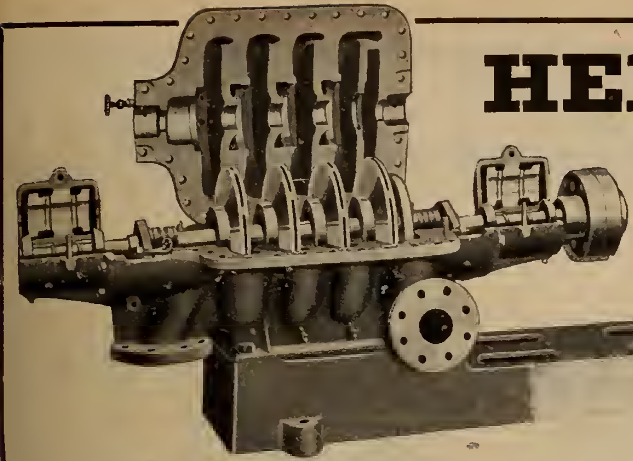

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Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.

Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.
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By its long reach, a SAUERMAN DRAGLINE CABLEWAY EXCAVATOR is enabled to dig to any depth and handle sand and gravel from the pit direct to plant without help of any auxiliary conveyor.

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Agents: F. H. Hopkins & Co. Ltd.,
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SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

Works at Walkerville, Ontario

When placing your
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HYDRANTS,
VALVES
and
VALVE
BOXES
place it with us.

MADE IN CANADA

Strong, Substantial and
Modern Designs.
Prices right.
Write for prices and see.

THE KERR ENGINE CO. LIMITED
VALVE AND HYDRANT MANUFACTURERS
WALKERVILLE, ONT.

GREENING
WIRE ROPE

When Time is Money
You Can Depend
Upon Greening Service

The B. Greening Wire Company carry ample stocks of all their standard products at warehouses in Hamilton, Montreal and in Winnipeg.

This enables them to give prompt service and to make immediate shipments.

If you are in a hurry for any wire products, it will pay you to wire or telephone our nearest office.

Wire Rope Wire Cloth
Steel Chains

Write for our Graphic Catalogues or we will be glad to supply you with any special data you require governing the use of any of our products.

The B. Greening Wire Co., Limited
Hamilton, Ontario
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CAST IRON PIPE

STANDARD CAST IRON PIPE
also
DeLAVAUD Centrifugal Process

All sizes in Stock
for

WATER CULVERT
GAS SEWER

Lake or Rail Shipment

NATIONAL IRON CORPORATION LIMITED
Head Office, Works and Docks TORONTO

Made in Canada
Conduit

Electric Wiring
Made Safe

XCELADUCT
Labelled under supervision of Underwriters Laboratories
(GALVANIZED)

For All
Electrical
Instal-
lations

Manufactured by
National Conduit Co., Limited
Toronto

Rails New
12, 16, 20, 25, 30, 35, 40, 60, 80, 85, 100 lb.
Splice Bar, Bolts, Spike Switches.

Rails Relaying
30, 45, 50, 52, 56, 60, 65, 70 lb.
Splice Bars, Spike, Switches.

Jno. J. Gartshore, Limited
TORONTO

One dollar per day saved on each bricklayer by using

RENFREW LIME

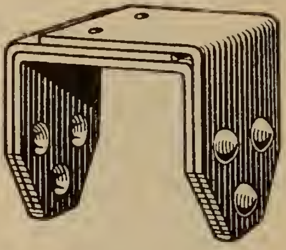
Because the mortar requires less tempering on the board. It will not set too quickly, and allows bricklayer to bed more bricks at a time. Bricks are easier bedded down. All these advantages helps the bricklayer to lay many more bricks each day. The mortar sets very hard. The lime will take more sand, and costs no more than other limes.

Jamieson Lime Company
Manufacturers: LIME, BRICK, FARM TILE.
Renfrew, Ontario

BULL DOG FLOOR CLIP

Put the BULL-DOG on *your* Pay-roll

With this device it is possible to secure the advantages of wood floors in reinforced concrete buildings—at an economical cost, at a vital saving of time, and with a reduction of 18,000 lbs. dead load per 1,000 sq. ft. Conceded by the leading architects and builders to be the best device of its kind and 100 per cent efficient. More than ten million sold last year on the American market.



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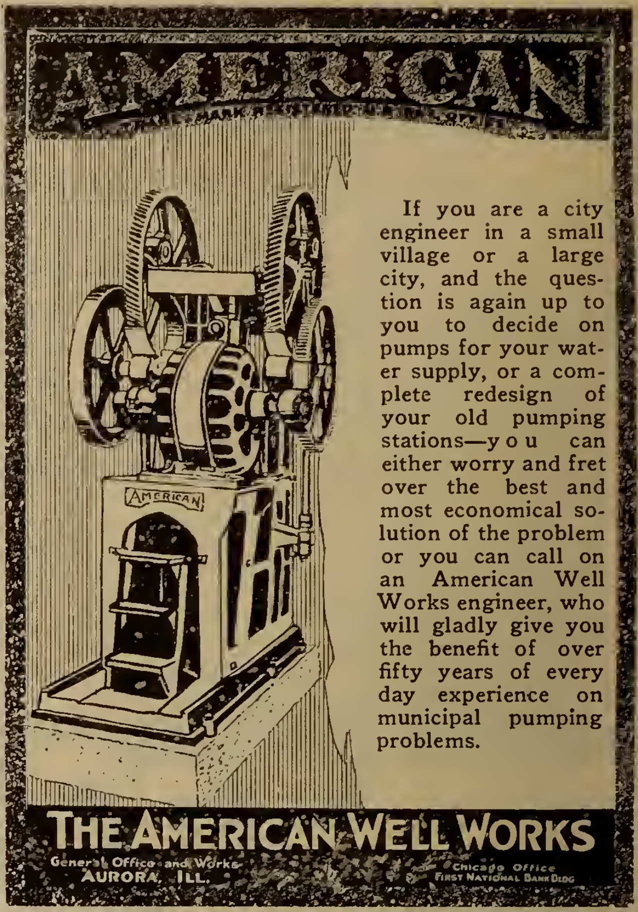
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AMERICAN

If you are a city engineer in a small village or a large city, and the question is again up to you to decide on pumps for your water supply, or a complete redesign of your old pumping stations—you can either worry and fret over the best and most economical solution of the problem or you can call on an American Well Works engineer, who will gladly give you the benefit of over fifty years of every day experience on municipal pumping problems.

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NEPTUNE

The Pioneer of Progress

TRIDENT COMPOUND

This is the ideal meter for use on variable-demand lines because it registers accurately the peak as well as the off-hour flow. The Trident Compound is designed and built as a single unit and operates as such, eliminating the difficulties and troubles which accompany the coupling of two individual meters under one housing. The increased revenue this meter brings in will pay for its initial cost in a short time.

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Consulting and Inspecting Engineers
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Expert inspection and tests on all materials and equipment.

Parties having Relaying Rails, Cars, Locomotives and other used equipment for sale, are invited to list same with us, in view of various enquiries from clients for such information.

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Lumber at First Cost
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Any Quantity Rough Dimension, Timber—Square and Round, Rock Elm and White Oak Timber, White Pine, Hemlock and Spruce Lumber. All thicknesses. Can be dressed in transit.
Hardwood Lumber—all kinds, all thicknesses, all grades. In our Toronto yard.
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Let us quote you prices.

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26 Queen St. East, Toronto Phone: Main 2806

We specialize in

Docks	**Foundations**
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MANUFACTURERS OF

Flexible and Flange Pipe
and Special Castings

Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
for Water, Gas, and Culvert

HAMILTON, ONT.

VANCOUVER WOOD PIPE
& TANK CO., LTD.

Contractors for Waterworks Construction,
Manufacturers of Wire-Wound Wood Pipe, Continuous Stave Pipe, Tanks, Silos, Steam Casing.

See our new patented Wood Pipe Coupling—Positively LEAK PROOF

We are the originators of the BORED OUT Wood Sleeve Coupling

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508 Hastings St. W. VANCOUVER, B.C

Fabricated Steel

CANADIAN TANKS DES MOINES TRADE MARK

We design, fabricate and erect steel structures to meet your needs. DES MOINES erection crews have become experts through years of experience.

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Conduits

for Interior Construction

Conduits Company, Limited

Sole Manufacturers under Canadian and U. S. Letters Patent

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ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
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CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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The Livest Firms and Progressive Towns Will Use

High Powered Gasoline Engines on Centrifugal Pumps, Air Compressors

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THE ENGINE OF REFINEMENT

Shovels, Locomotives and Electric Generators

BECAUSE—

They cost less than any other form of power.

Are cheaper to run than a steam plant, particularly in isolated districts.

Are easily transported, readily installed.

Can be run by any intelligent engineer.

Are built in large sizes for big pumps and generators.

The contractor with this equipment carries the smaller investment, can work faster, with less labor, finish the job sooner; under bid the other fellow and handle more jobs at a profit. The city or manufacturer that uses STERLINGS for emergency has an unfailing source of power.

Send for a catalog.

Sterling Engine Company Dept. C-9 Buffalo, N.Y., U.S.A.

50 Ton Gasoline Electric Locomotive project of General Electric Company, 225 H. P. STERLING engine on continuous daily switching duty since May 1st. Can handle 35 car loads. One of the big jobs for which STERLINGS are employed. STERLINGS are used also for municipal pumping and on stationary electric generators

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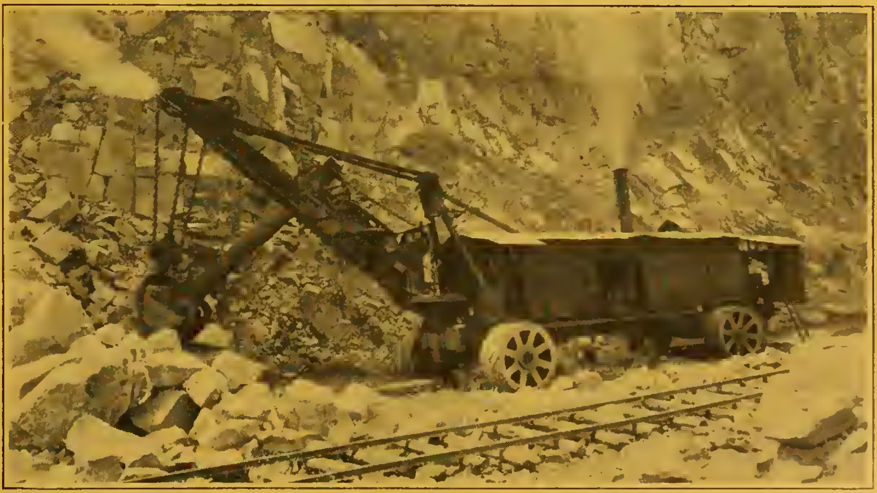

is the way an owner of a Railroad type Steam Shovel characterized the New Traction Wheel Mountings for Railroad Shovels. But it IS true. The largest type of Railroad Steam Shovel has been successfully mounted on traction wheels. We have some data that will interest you. Ask for Bulletin 235.

1½ to 6-yd. Railroad Type Steam Shovels.

¾—1—1¼-yd. Revolving Type Steam Shovels.

The OSGOOD Company, Marion, Ohio, U.S.A.

“Dominion” Wire Rope

Flexibility and Strength
for the
Stiffest Requirements

Let us quote you for
BLOCKS, CLIPS, THIMBLES AND SHACKLES

THE DOMINION WIRE ROPE CO., LIMITED

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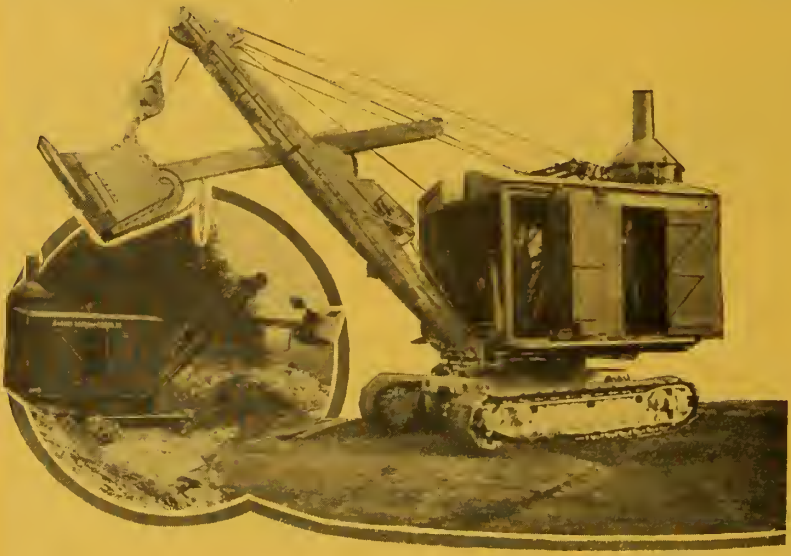
Also at: TORONTO - WINNIPEG



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AND CRANES
JORDAN SPREADERS
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CONCRETE MIXERS

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Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, October 3, 1923 No. 40

Contract Record and Engineering Review

On the Kingston Road.

IMPERIAL Asphalt PRODUCTS

Two more sections of Asphalt, both at the Toronto end of the Kingston Road, have now been opened to traffic. One of these from the C.N.R. crossing at West Hill on as far as Rouge Hill completes a 17 mile stretch of Asphalt pavement from West Hill to Whitby. The other section is from the Scarboro High School to the Kennedy Road, which will eventually join up with Danforth Avenue.

Contracts called for 3″ Hot-Mix Asphalt (1½″ Sheet Asphalt, 1½″ Asphalt binder) over a concrete base. Work was done by the Provincial Contracting Company Limited, under the supervision of the Department of Public Highways of the Province. Imperial Asphalt was used throughout.

Traffic on this highway is heavy. Trucks, wagons, jitneys and touring cars in large numbers follow this route, but in selecting Asphalt as the type, both officials and public are assured of the most serviceable pavement as well as an economic investment.

Looking east towards West Hill, from the C. N. R crossing

ROAD ENGINEERING DEPARTMENT

Toronto **Imperial Oil Limited** Canada

Kingston Road near Toronto, looking east from the Half-Way House.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS
and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected
WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

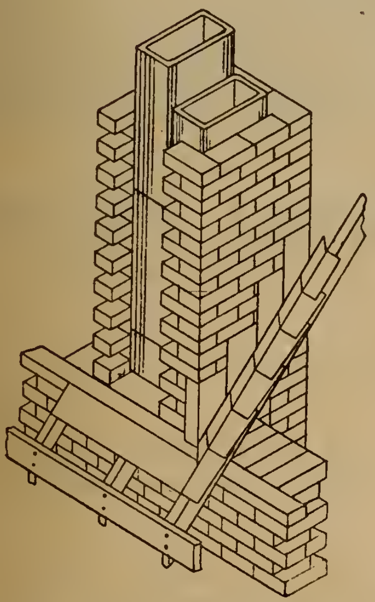
550 Pacific St., VANCOUVER, B. C.

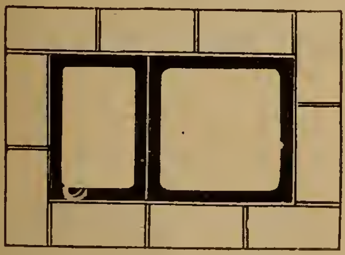
Fire Prevention Week Oct. 7th to 13th

The increased cost of Fire Brigade maintenance and the heavy capital expenditures in the most modern fire fighting equipment has not reduced Fire Loss or the cost of Fire Insurance.

Comparison of fire losses and of structural conditions in Canada and Europe leads to the conclusion that a radical change in building methods is fundamental to the curtailment of Canada's fire loss. Serious fires in Europe are exceptional occurrences and conflagrations are almost unknown. The fire departments in the principal European cities are certainly no better than ours and, in the smaller places, comparison would be ludicrous. Their greater immunity from destructive fires is, undoubtedly, due in a large measure to superior construction.

J. GROVE SMITH,
Dominion Fire Commissioner.





The National Board of Fire Underwriters has investigated some two million fires. They find that defective flues and chimneys are responsible for the heaviest property losses in dwelling houses. They urge State, Provincial, and Municipal authorities to adopt building ordinances requiring a safer construction of chimneys. They state it is essential for safety that chimneys be built either with double walls of brick or lined with clay flue linings.

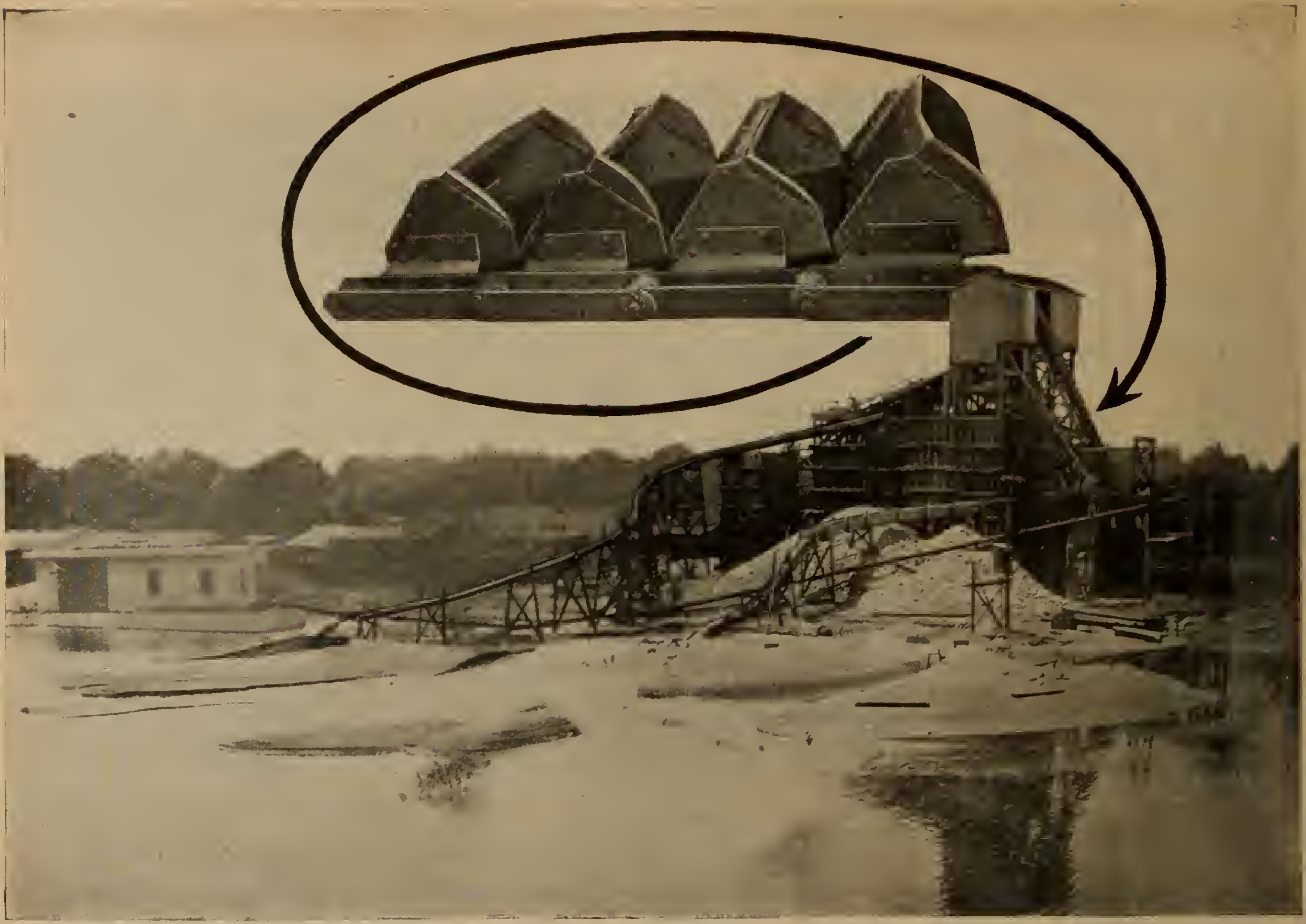
Some States in the Union have made this a matter of state legislation. Municipal authorities, both in the States and in Canada have revised their building by-laws and now regulate chimney construction. Those that have had such regulations in force for some years report a distinct reduction in the number of fires and in consequence have secured a better rating from the Underwriters, by which all citizens benefit.

Fire Prevention is better than Fire Fighting. Has your Municipality a Chimney By-law?

For copies of model bylaws, regulating chimney construction, write to:

VITRIFIED CLAY PIPE PUBLICITY BUREAU

9 Wellington St. E. Toronto. St. Johns, P.Q. New Glasgow N.S.



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WE ALSO MAKE

- Elevators and Conveyors
- Sand and Gravel Washing Plants
- Stone and Lime Handling Equipment
- Locomotive Cranes
- Crawler Cranes
- Portable Loaders
- Dragline Excavators
- Screens
- Sand Separators
- Crushers
- Chains, Wheels, Buckets
- Gears, Transmission Machinery
- Send for Catalogs

HERE is a special Link-Belt De-Watering Elevator, which digs from a sump and delivers the sand and gravel—with most of the water eliminated—to the top of the plant.

This type of Link-Belt elevator, used in connection with pumping plant, avoids the necessity of elevating both water and material.

Link-Belt engineers specialize in solving handling problems—no matter what the material. Let them help you put your plant in good working order. We invite correspondence.

LINK-BELT LIMITED
(FORMERLY CANADIAN LINK-BELT COMPANY, LIMITED)

TORONTO—WELLINGTON AND PETER STREETS
MONTREAL—10 GAUVIN LANE

LINK-BELT

JOSEPH B. FORRESTAL CO. CONTRACTORS. MILWAUKEE WIS
Manufactured by THE BUCKEYE TRACTION DITCHER CO. FINDLAY O.
Buckeye✓

Buckeyes are "TOUGH"

BUCKEYES are long on performance and short on cost. They go through the hardest digging day after day, year after year, with surprisingly few repairs.

Buckeyes are tough! The digging chain is special electric steel. The buckets are one-piece heavy pressed steel. The heavy motor has plenty of power. The frame itself is built like a bridge, with heavy gusset plates, riveted. Buckeye Alligator Traction is noted for its sturdiness.

Service is built into Buckeyes. You'll say so too when you own one.

What Buckeye Owners Say—

The success of a machine is measured by the praise of its owners. Hear them talk about big yardage, low cost and dependability in the Model C bulletin. If you want a copy **tell us.** We've been wanting to send you one.

The Buckeye Traction Ditcher Company, Findlay, Ohio

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

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Chatham, Ontario

Sales Representative:
The General Supply Company of Canada, Ltd.,
85 Water Street,
Winnipeg, Manitoba

London Office:
John Birch & Co. Ltd.,
2, London Wall Buildings,
London, E.C. 2, England

Buckeye✓

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The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada

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Engineers, Manufacturers and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.

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Prompt Delivery

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Toronto, Canada

Adel. 4318 **Adel. 6900**

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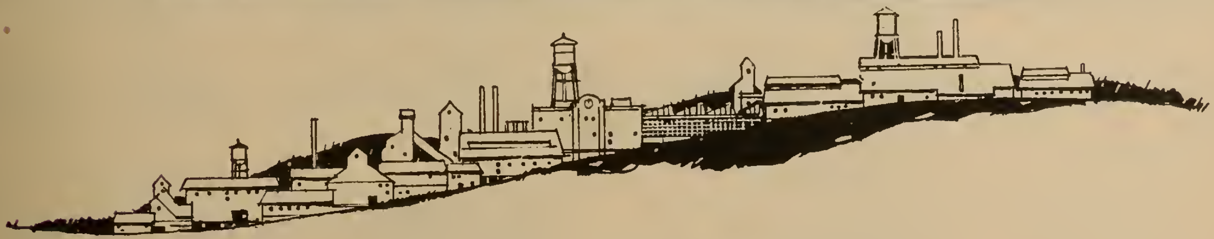

Water in Every Home, Factory and Public Building—

Of course, the first and most vital reason for erecting a Canadian Des Moines Elevated Steel Tank is to store water for fire protection. But the comfort and convenience of a modern water works system are important arguments for these tanks.

Water in the home makes living more comfortable and sanitary and lightens the burden of the woman in the home. Hand pumped wells should find no place in Canadian community life today. They can be replaced with pure, fresh, flowing water at little cost and with great saving in time and trouble. Factories and public buildings also need water distributed in the modern way.

A standard Canadian Des Moines Elevated Steel Tank will store from 25,000 to 100,000 gallons of water. These long-lived, economical tanks have been built as large as 600,000 gallons! The cost of storage per gallon is extremely low.

Live more comfortably and more safely.

CANADIAN TANKS DES MOINES
TRADE MARK

Canadian Des Moines Steel Co.

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Only the "Caterpillar"* has the power, traction and endurance required for difficult engineering jobs encountered in reclamation, irrigation, dirt moving, levee and railroad construction, logging, oilfield development, roadmaking, and cross-country transportation of machinery, materials and products.

Experienced engineers in Canada and many other countries are relying upon the proved ability of the "Caterpillar" for the performance of tasks too important and too difficult to be entrusted to any other machine or method. The "Caterpillar" has no successful rival in handling the world's hardest tractive jobs easily and economically.

Let us furnish you "Caterpillar" Performance records on 2-ton, 5-ton, and 10-ton sizes.

**There is but one "Caterpillar"—Holt builds it*

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468 Lagauchetiere St. W., Montreal, P. Q.
Telephone Main 1589

WE MAINTAIN COMPLETE SERVICE STOCKS

CATERPILLAR
TRADE MARK
HOLT

"A Grim Tragedy that could easily have been avoided"

In its leading editorial of August 29th, 1923, the Contract Record sums up in a nutshell something of the feeling which remains in the mind of the general public following the Wawa Hotel disaster. "Should it be possible for such a death trap to exist" it asks. "Is it not up to the building and construction industry to move for the prevention of a similar tragedy in the future"?

Eight lives lost; $250,000 property and personal loss; untold agony, suffering and sorrow; homes wrecked; holidays ruined.

"The most distressing thing about the whole matter is the fact that it could have been avoided!"

Why Build

Here's the Answer:

The Wawa Hotel, either during construction or at any time since could have been fireproofed at nominal cost by the following Gyproc methods:

During Construction:

1. In the place of wood siding behind face brick or other masonry veneer, as an insulator.
2. In the place of wood sheathing behind the clap boards, as a fire stop.
3. Between wood sheathing and the clap boards of shingles, as a fire stop.
4. Upon the wood roof boards and under shingles or metal roof covering, as a fire stop and insulator.
5. Under the finished floor, or between the rough and finished floor, as a fire stop and sound deadener.
6. Within concealed air spaces as a fire stop.

Since Construction:

By the addition of sheets of Gyproc applied to walls and ceilings. This last provides an astonishingly high degree of fire protection at low cost.

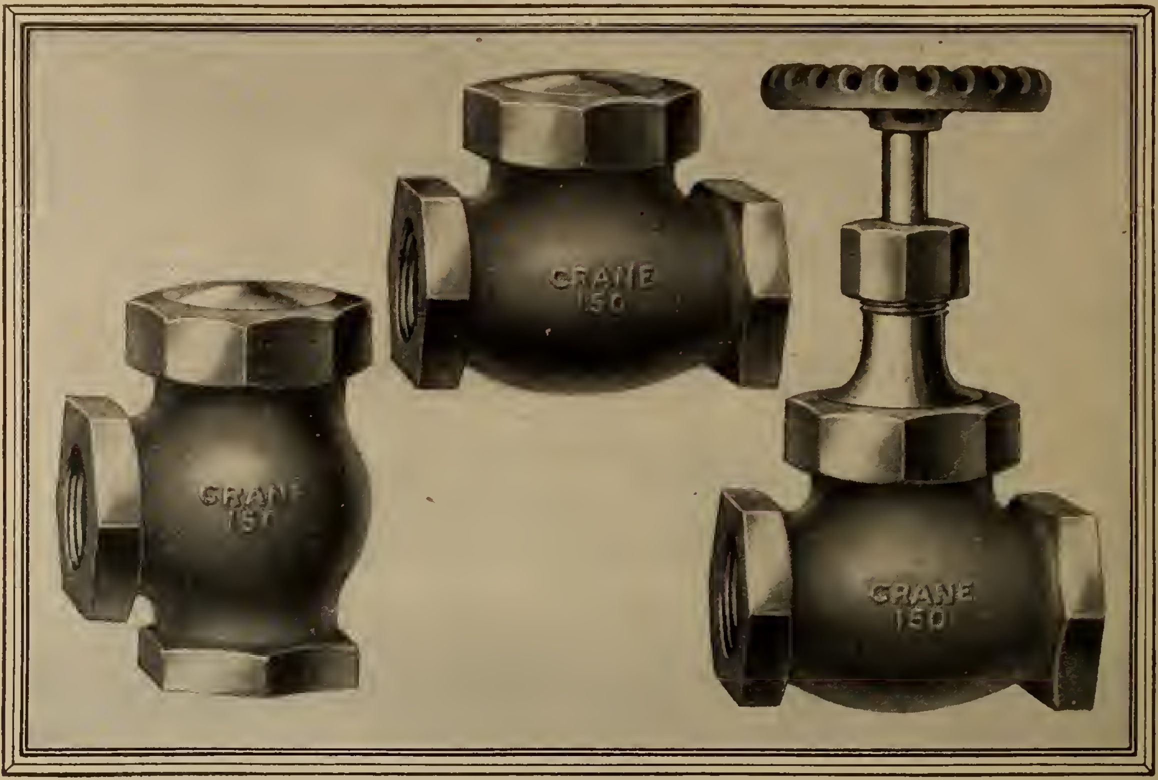
If you're interested drop us a card for full particulars

The Ontario Gypsum Company, Limited

Head Office: PARIS, ONT.

Toronto Office: 106 Don Esplanade **Montreal: 10 Cathcart Street**
Windsor: 30 LaBelle Bldg. **Factories: Caledonia, Ont., Lythmore, Ont.**

to Burn?



NO. 7 ANGLE CHECK VALVE, CHECK VALVE AND BRASS GLOBE VALVE

VALVE ENDURANCE TO CUT UPKEEP COSTS

Long life is built into every Crane check valve. Their renewable discs outlast others because the guides of special design confine wire drawing to the metal. True and accurate piping connections make them line up perfectly in an installation.

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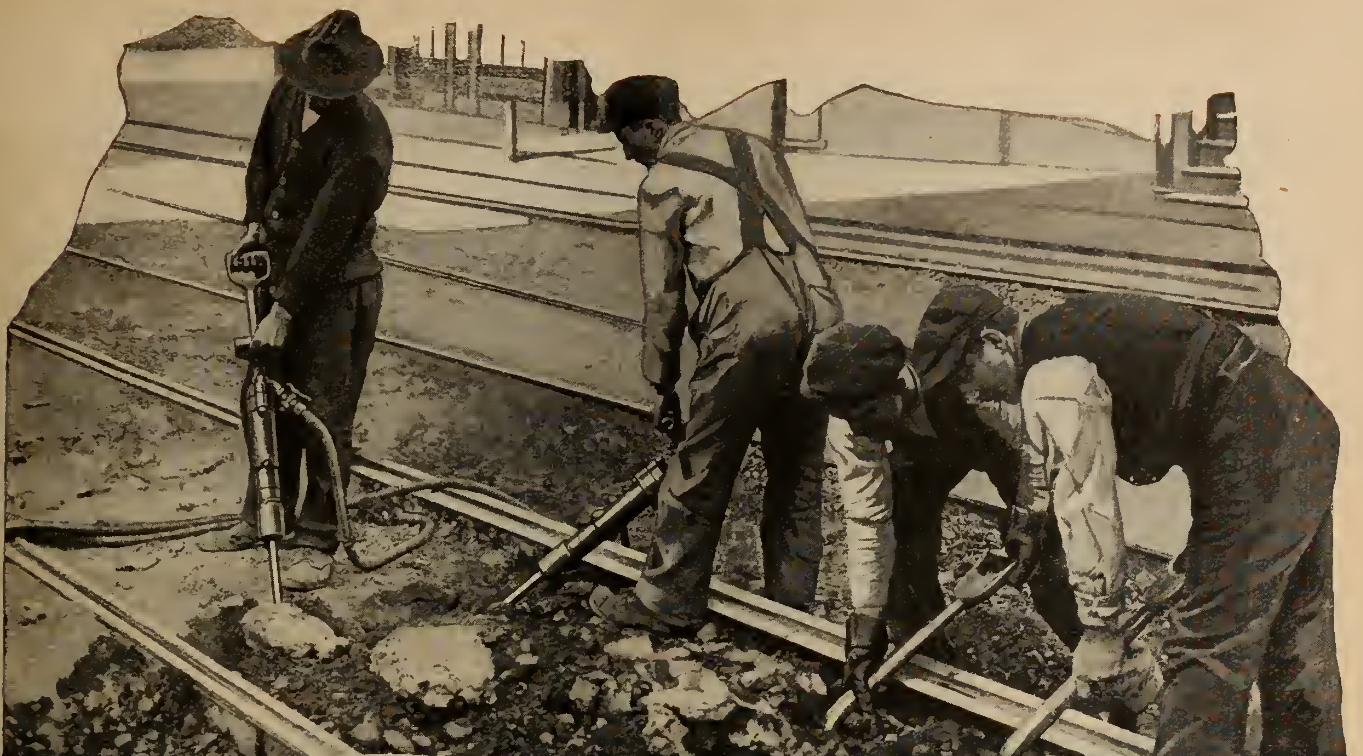

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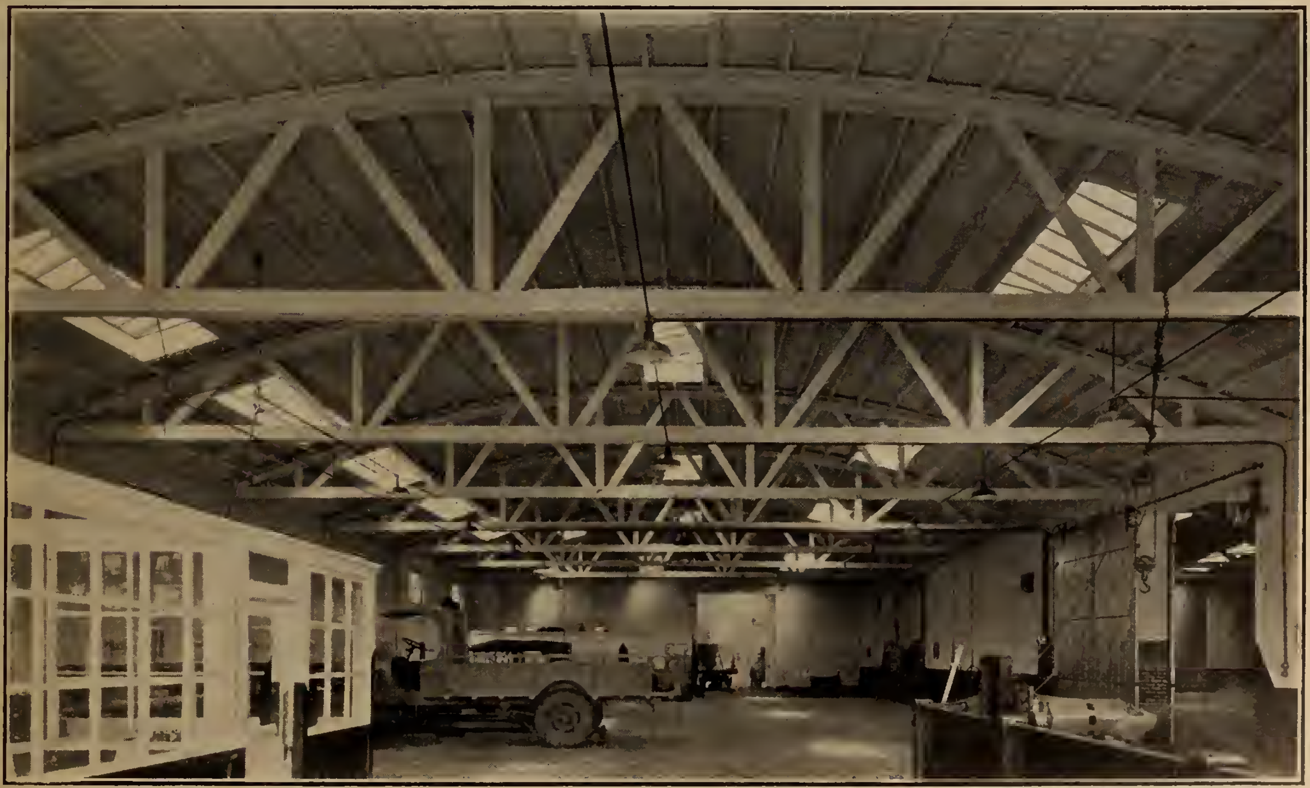

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Take Your Crusher to the Stone

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We unreservedly recommend the Western-Aurora crusher. Send for descriptions in detail.

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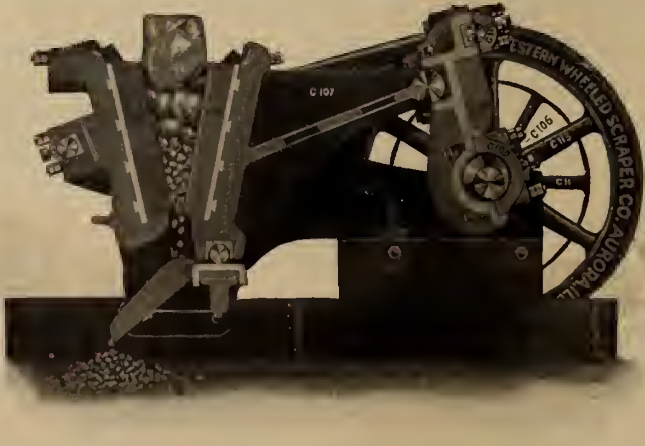
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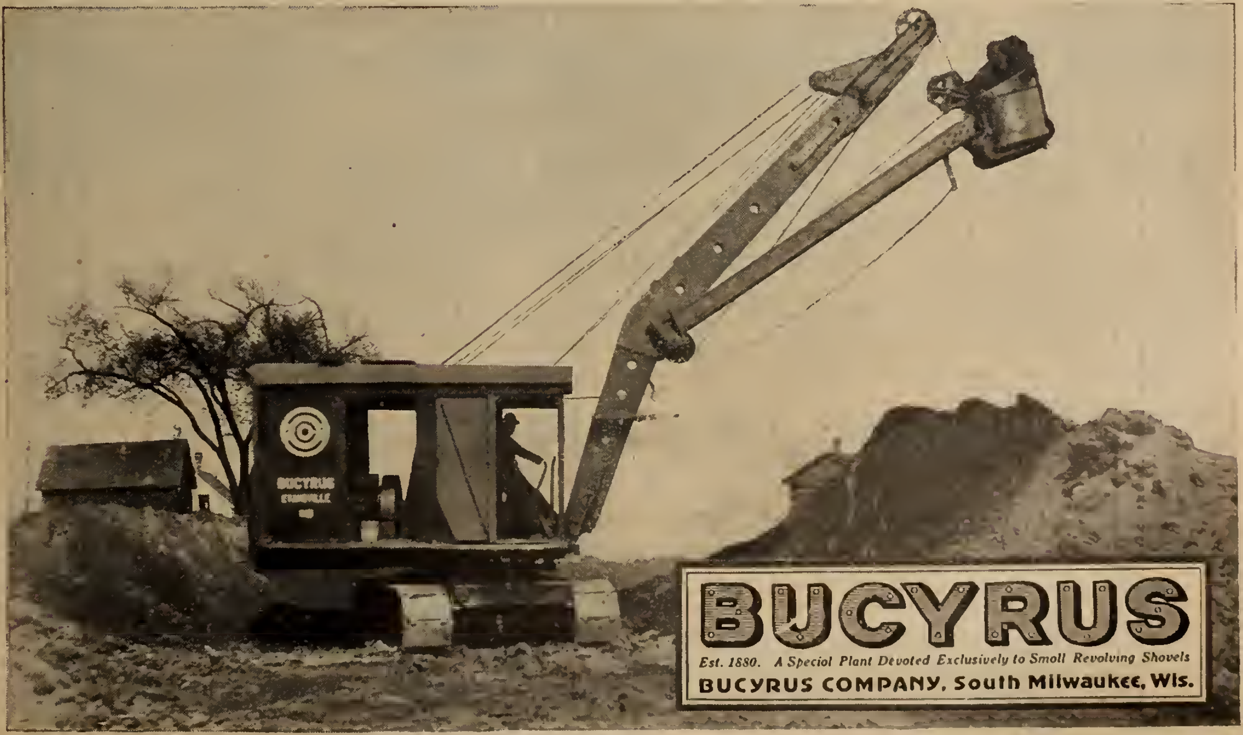

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CLEMENT F. SCULLEY EQUIPMENT CO.
GRADING and EXCAVATING CONTRACTORS
No 5
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—a mounting that is fully lubricated, with every tread link bearing and roller bearing automatically oiled from internal reservoirs.

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And— no amount of travel can injure the tread link bearing. Every bearing is **bushed** with a very hard spring steel bushing that is long wearing— and easy to renew at slight expense.

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— C. F. Sculley, President, Clement F. Sculley Equipment Co., St. Paul, Minn. (They have 4 ERIES).

Mr. Sculley has also written this letter to a contractor who was "looking around" for the right shovel:

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Photo by Underwood and Underwood.

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Structural Steel framework of the Reford Building, Toronto

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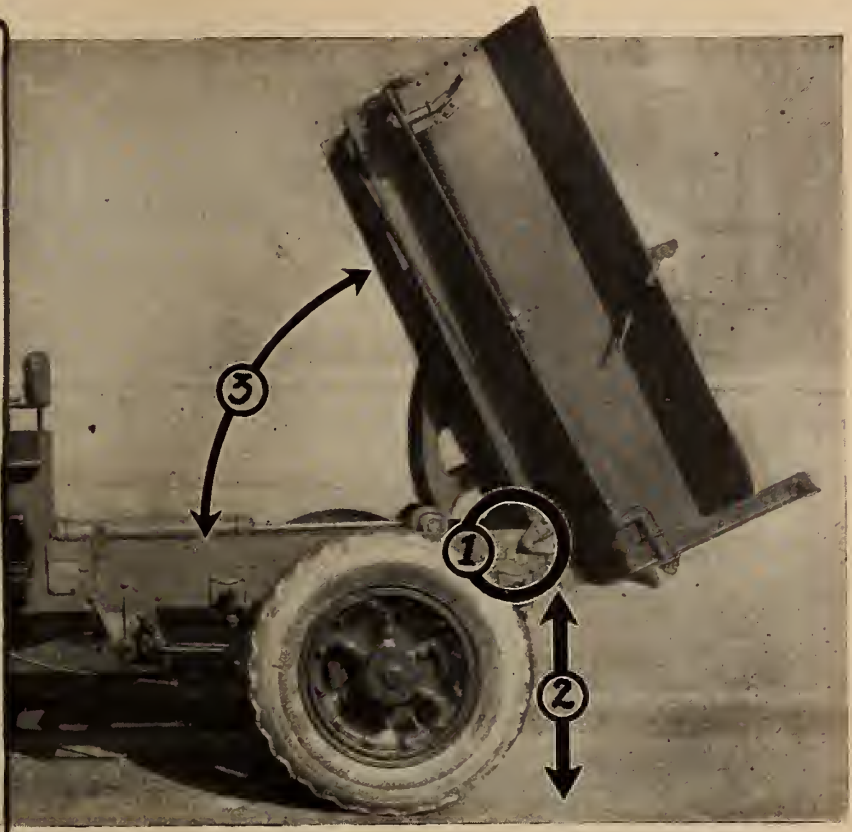

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Simplicity, made possible by the few working parts; efficiency, because oil transmits the power; and strength from its compact, sturdy construction; these features make Wood-Canada equipment dependable.

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We will gladly advise you as to the correct Wood-Canada Hydraulic Hoist for your chassis, and the best steel body for your work. Just tell us what truck you want to equip and the conditions under which it must operate.

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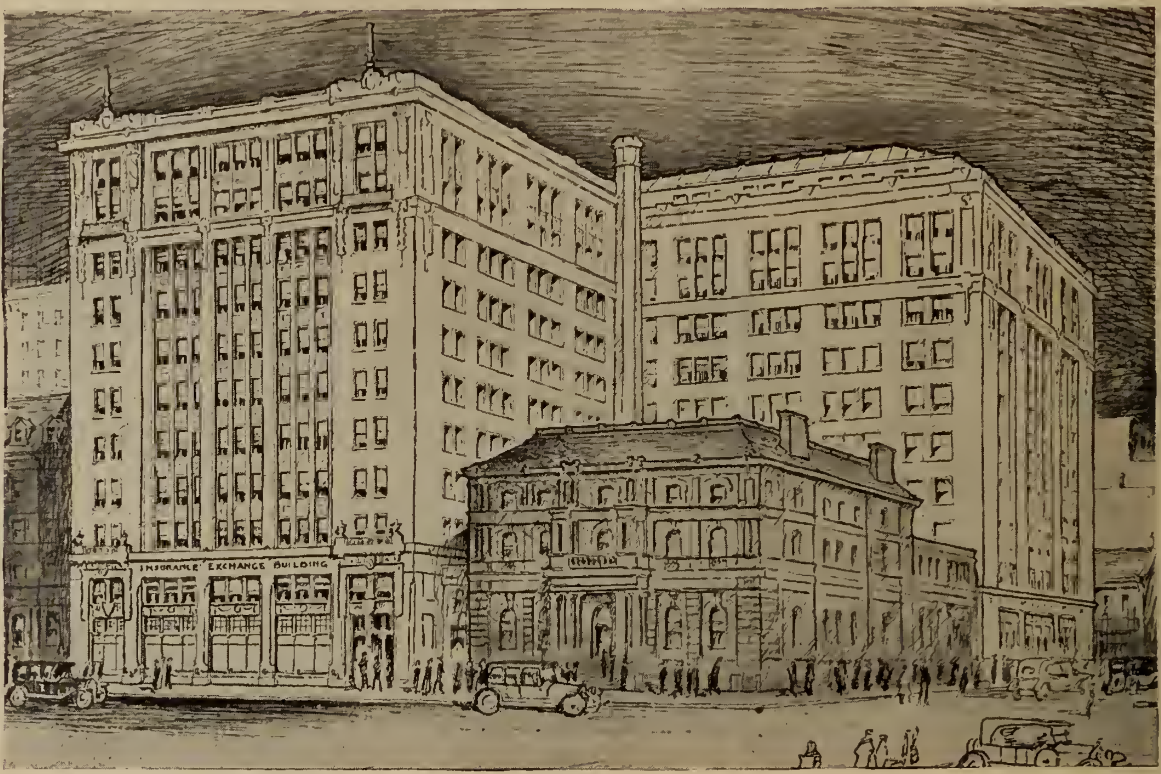

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ESTABLISHED 1886

Contract Record and Engineering Review

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Municipal Officials, etc.
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Winter Need Offer No Obstacles to Building

In another few weeks winter weather will be with us again in earnest. The contemplation of this fact leads us to wonder what course construction will pursue. Will the bulk of it be tied up and will contractors hibernate? Or will the snow and the cold make but little difference? Undoubtedly, there must be some cessation of activity, especially in outside work where the cold interferes more or less seriously with manual labors, but investigation discloses no real justification for the entire stopping of all building just simply because, in the natural course of events, the weather has become snowy and cold. There was a time not so very long ago when with the first approach of winter building activity ceased absolutely. No reason accounted for this tendency other than a mere belief, firmly established through years of acceptance, that winter was detrimental to the continuation of building. In the past few years, this belief has been pretty well shattered for there have been a large number of instances where construction work has been satisfactorily carried on in spite of low temperatures and heavy snowfalls.

The high cost of seasonal fluctuations—for they do cost something—has served to promote among construction organizations and other interested bodies a movement that aims to place construction on an all-year-round basis. Thus the American Construction Council and the Association of Canadian Building and Construction Industries both started propaganda having as its object the elimination of seasonal construction as far as possible. The chief idea behind the movement is that there is a great deal of building which may conveniently be carried out in the winter months without any detriment to the building itself. By carrying out all such construction a very large proportion of building labor would be profitably employed, and the great demand for mechanics during the summer months would be relieved. It is the usual scarcity of labor during the busy season that helps to boost the cost of building, but this would be counteracted by a larger measure of winter-time construction. The earlier occupancy that is possible is also another item which, from the owner's point of view, is worth considering seriously. Very often the use of the building for a few months will far more than pay for any cost that erection during the cold weather may have entailed.

Even if it is not desired, or it is impossible, to carry on outside work during the cold weather, advantage can be taken of the winter months to carry on inside trades if the building is closed in during the autumn. This practice seems to be gaining in favor and more and more contracts are being let in the late summer and early fall. On ordinary types of buildings this permits their enclosure before winter sets in and enables the inside to be finished in comparative comfort. The earlier occupation which this method assures seem to be the argument that is inducing an increasing number of owners to award their contracts in the fall rather than to wait until the spring.

The cement manufacturers, the Portland Cement Association, and contractors specializing in concrete have all urged the continuation of concrete operations during the winter months. Indeed, there is ample proof that by the adoption of a few simple precautions, such construction may be safely carried out. If concreting can be performed during the winter, without danger, then how much more safely can other forms of building? The hazards are really few, but the advantages many, and it would be well to study closely the possibilities of a greater measure of winter construction.

Winter Storage Prevents Summer Shutdown

As an instance of how winter months may be used to advantage in the construction industry, a case may be cited concerning a number of road contractors operating in one of the American states. Last spring, before the weather was suitable for the laying of concrete pavement, contractors in that state had more than 1,500,000 cu. yds. of sand and stone in stock piles and over 1,000,000 bags of portland cement in

No. 101

Canada's Engineers—A. Cousineau

Mr. Aime Cousineau who has suggested an elaborate general unit plan and management scheme for the sanitation of residences and other buildings of the city of Montreal, was born in that city in 1885. He received his primary education at Mont St. Louis College from which he graduated in science in 1905, to afterwards follow the engineering course of L'Ecole Polytechnique, Montreal, obtaining in 1909 the diploma of civil engineer and the degree of B.A.Sc.

From 1909 to 1913 Mr. Cousineau was employed in different capacities by the Dominion Department of the Interior at Ottawa, relinquishing this position to attend a special course in sanitary engineering at the Massachusetts Institute of Technology, Boston, and at Harvard University. He successfully obtained from both universities the degree of B.Sc. in sanitary engineering. In 1916 upon his return to Montreal, Mr. Cousineau was appointed sanitary engineer for the City which position he still holds, and manages with exceptional ability, having successfully introduced numerous new methods of making his department of the Board of Health most efficient.

Mr. Cousineau is an associate member of the Engineering Institute of Canada, member of the Quebec Association of Professional Engineers, member of the American Water Works Association, member of the American Public Health Association and member of the Town Planning Institute of Canada.

Mr. A. Cousineau

warehouses on the job, ready for use just as soon as the weather permitted the mixing and placing of concrete. These materials were obtained and stored in accordance with the contractors' agreements with the state, which provided liberal payments for materials in storage and so reduced the contractors' tied-up capital to a minimum. The result has been that during 1923 over 1,000 miles of concrete highways have been added to the state's system. Practically no delays in concreting operations have been caused by lack of material, while proper tests at the sources of supply guaranteed the quantity of the material in storage.

It was this state's policy of awarding contracts in the late summer and fall that made possible this highly desirable condition of preparedness. Storage of material is required on practically all road contracts, irrespective of the time of year awarded, but by awarding the contracts in the fall, the winter months, which are unsuitable for paving operations, are available for that purpose.

By the adoption of this method, the summer peak on material producing plants and transportation facilities is reduced. Delays due to lack of material during construction, which are always expensive to the contractor, are eliminated. The heavy call on inspection facilities is reduced and the road improvement is completed with the least interruption to traffic.

A Record in the U. S. Cement Industry

All records for the production and shipment of portland cement in the United States were broken in August, according to figures just issued by the U.S. Geological Survey. Production during August was 12,967,000 barrels, an increase of 350,000 barrels over July, the best previous record, and, 1,300,000 over August last year. Production for eight months ending August 31 was nearly 88,000,000 barrels or more than was produced in any of the entire years 1915, 1918 or 1919.

Shipments from the mills during August were only slightly under 15,000,000, or more than 600,000 barrels greater than in any previous month. Shipments for the first eight months of the year were nearly 91,000,000 barrels or more than 10 per cent greater than ever before.

Although shipments exceed production during August by about 2,000,000 barrels, the stocks of cement in manufacturers' hands at the end of the month were somewhat greater than last year and amounted to slightly over 6,000,000 barrels.

Present conditions indicate a substantial fall demand for cement so returns for the full year should be far beyond any previous experience. Building permits issued in August show a substantial increase over last year. There is a very heavy volume of building now under construction and prospects for winter construction are considered good. Many highway officials have expressed a determination to complete this year's roadbuilding programs so the amount of cement consumed in concrete pavements will undoubtedly be greater than in any past year.

The Making of Good Concrete

"Concrete Data for Engineers and Contractors" is the title of a 16-page booklet, issued by the Portland Cement Association, dealing with the essential principles involved in the making of good concrete. The text reviews the results of investigations relating to the effect of aggregate grading, quantity of mixing water, time of mixing and method of curing.

Fire-Swept Town Being Well Rebuilt

Splendid Buildings Have Been Erected in Aylmer, P. Q., to Replace Those Destroyed in the Disastrous Conflagration of August, 1921 —Builders Given Financial Assistance

By our Ottawa Correspondent

In August 1921, the town of Aylmer, P.Q., suffered the loss by fire of a large portion of its business section and a considerable portion of its residential district, one hundred and thirty buildings of all kinds being destroyed. The conflagration involved a loss of nearly one million dollars.

After the fire, on account of the approaching fall and winter seasons, steps were immediately taken for the rebuilding of the destroyed sections. A great many of the burnt houses were well under way when the winter set in, and within a year or so after the fire most of the destroyed buildings were up again. Considering the difficult building trade conditions existing at that time, the directing heads of the town deserve great credit for their work of organizing means of reconstruction and for the manner in which it was carried out.

Taking advantage of the opportunity offered to improve the old conditions with regard to town planning, a housing committee was formed with the object of developing a scheme of building according to well defined plans and regulations. All buildings must now be erected in accordance with these regulations which provide that the plans for all proposed works shall be submitted to the housing committee and to the Provincial Board of Health for approval and, furthermore, all buildings to be erected within defined areas must be of either brick, stone or stucco only, and have an approved heating system. There is also a provision limiting the height of the cellar to a minimum of 5 ft. 10 inches.

A loan of $400,000 was obtained from the Quebec government which with moneys collected from other sources enabled the Committee to successfully carry out its rebuilding scheme. From September 1921 to January 1923, one hundred and sixteen houses and other buildings had been rebuilt, every structure being modern in every respect. Since January 1923 to January 1924, there will be forty-two more houses completed. An amount of nearly $200,000 is still available to prospective builders and the committee states that this entire amount will likely be taken up within the next year. The amount advanced to builders is $3,200.00, and is available at once at a rate of 5 per cent only. The total monthly sum for the repayment of the loan, including interest and sinking fund, amounts to $21.00. The committee has

Typical residences erected in the town of Aylmer, Ont.

(Continued on page 945)

Writing Fool-Proof Specifications

William F. Wischmeyer, Before the Illinois Society of Architects, Tells How to Prepare Contract Documents that are Explicit —Practical Knowledge is Necessary

In the contractor's office the estimators call specifications "the vaudeville side of architecture" because of the humorous expressions contained in them. The estimator invariably makes notes of the contradictory things he finds and with his friends has a good laugh over them.

First of all, what is a specification? Most specification writers define the documents as a description of materials and workmanship entering into the production of a certain type of structure. We learn from this that materials and workmanship form the backbone of the document, while general divisions and notes govern requirements of certain specification work. In discussing the subject it might be well to follow the order in which the specifications are written. First, general conditions; second, materials; third, workmanship.

Speaking of general conditions, I have always liked to define general condition as "obligations" which must be assumed by the owner, architect, and contractor respectively. It has frequently been the case that general conditions were used as a club to brandish over the head of the contractor. Many architects use lengthy general conditions which incorporate much that rightly belongs to the contract agreements, and frequently the conditions of the two documents clash.

Documents Should be Complimentary

The two instruments should be complimentary to one another, and should agree in both spirit and letter. We have found that to incorporate a phrase in our contract stating how monthly payments should be made, referring to such and such an article in the general conditions, always takes care of the situation no matter what conditions govern. Often paragraphs are written into the specifications in which the architect binds himself to certain obligations he has no right to assume, later neglecting them, and as proceedings ensue he becomes a burden instead of a protection to his client.

Many architects insert in the general conditions paragraphs which safeguard against many errors or omissions on the part of the contractor, so that the contractor loses interest in work. In my opinion this is unjust, and I have known occasions while estimating when both sub-contractors and general contractors have refused to submit figures due to the unfairness and the confusion in the general conditions. Entirely frank and clear general conditions, without any intention of putting it over on the contractor, never fail to bring in a correct bid. In other words, the general conditions should express obligations of the contractor and state what he is to include in his estimate in addition to materials and workmanship under the various headings and subheadings.

We have analyzed many things in condensing our own general conditions to about four pages. At the outset we state what the owner is obligated to do under these general conditions. He reserves the right to reject any and all bids and to let the work to other contractors, and reserves the right to select contractors, paying a preference. He is to make certain payments and take out and pay for fire and cyclone insurance, and to pay for fuel to heat the building only from the time the plaster is dry.

Among other duties, the architect approves samples and materials, examines shop drawings, and issues promptly certificates of payment.

Duties of the Contractor

The obligations of the contractors are: He is required to sign a contract to perform the entire work in a satisfactory manner. Where contractors are strangers in the office, we attach our contract form to the specifications, giving them a chance to see the contract they are to sign.

The contractor must select capable sub-contractors only, and shall not settle without the consent of the architect, and shall pay the sub-contractor to the extent of the sub-contractor's interest in the work; he must give the sub-contractor an opportunity to be present and submit evidence in any arbitration; he must be bound to the sub-contractor by all obligations that the owner assumes to the contractor under the general conditions, drawings and specifications; he must be solely responsible for the proper execution of the work and must furnish satisfactory surety bond for a certain per cent. of the work; and when required must keep the building heated until the plastering work is completed; must take out and pay for all forms of insurance except fire and cyclone, which the owner will pay for, and be solely responsible for accident or injury to employees or the public.

He must examine and check drawings and specifications, and if discrepancies are found report to architects. He must not require architects to inspect materials out of the city except at the expense of the contractor. He must keep on the work at all reasonable hours a competent superintendent satisfactory to the architect, with full authority to direct the work, receive instructions and give all necessary information that may be required. The contractor must not consider the issuance of certificates of payment as acceptance of the work.

He must keep the building reasonably clean and collect and remove from the premises all rubbish caused by the trades under his contract. He must see that each branch of the work will be installed by persons whose ability to execute it has been satisfactorily demonstrated to the architect. Then there are also paragraphs calling attention to permits, royalties, licenses, fees, municipal ordinances, state laws, and fire insurance bureaus.

That will give you an idea of the general conditions that we have built up in our office. We felt that in this way the contractor would be given the information that would obligate him wherever it would be necessary, he could make a charge against the contract for it, and I believe there is nothing I have mentioned which would conflict with the general contract. We have had these general conditions and our contract, as drawn up, turned over to lawyers, and they brought back the information that they could see no conflictions in our contract and general conditions.

Exact Naming of Materials

Next in order is materials. Of all the items in the specifications, I consider it of prime importance to mention the exact kind and quality of material desired by its trade name. Another difficulty is the placing of materials in their wrong classification so that there is confusion as to the trade name, and it often happens that the same kind of material is placed under several different headings. I recall once that when working as an estimator we had to tear down an entire specification and place the materials in their proper positions in order to make an accurate estimate.

Right here I might mention what I think to be some of the qualifications a specification writer should have. He should be well versed in building construction. This requires constant study and a complete and comprehensive catalog file. An architect or designer will have a superficial acquaintance with materials and will use certain materials in design which will not weather well, and it should be the privilege and duty of the specification writer to enlighten him on the subject and suggest proper materials. Such co-operation between designer and specification writer will produce the best results, as I know that designers have very little time to go into the quality of material.

Another important factor is the necessity of keeping in touch with the chief draftsman, gaining through him all of the information required, and seeing that no mistake is made in detailing the work. This supervision will allow the specification writer to investigate the conditions before the final rush to get out the specifications.

The specification writer should keep in touch with new materials and should make it a point to investigate results of those he has used. He should never fail to visit buildings for which he has written specifications. He should fairly constantly keep in touch with the superintendent and consult him frequently about specifications and drawings and seek information about how he might improve his work. He should consult with contractors and sub-contractors, and never refuse to give a few minutes of his time to all material men.

In this connection a good catalog system is of great value. I fear that many of us neglect material men. I appreciate the fact that if we would allow it, they would come into our offices in droves and bother the life out of us. As a rule, I have these men come in to see me at a certain hour, which I have set aside during the day to get acquainted with new materials. The specification writer should know about materials because he writes about the grades and kinds of materials the designer or draftsman places upon the drawing, and as a consequence he must know more about materials than anyone in the office.

Specifying Workmanship

Workmanship, as I understand it, means the skill and the knowledge in the placing of certain materials demanded of the workman in order that the work may be executed in a satisfying manner. In this connection, the specification writer should discuss with the designer the way in which he wants the materials prepared. For instance, the specification writer may say that the job is to be laid in cement mortar perfect to the line, all joints troweled, weather cut, etc. The designer goes out to the job and sees it and then rushes back to say that he had a cut joint in mind and that workmanship has practically destroyed his entire scheme. This does not mean that the designer should be hampered by the specification writer or chief draftsman, because the design should be studied from every angle before being condemned as being impractical.

How does the specification writer gain this information as to workmanship? First of all, he must be familiar with materials. He should have spent a few years drafting, several years as a superintendent, and should have made it his business to visit as many manufacturing plants as possible to acquaint himself with the manufacturing processes. Then he should place his confidence with reliable contractors and sub-contractors so that he can obtain first-class information for them. It is an excellent plan to visit buildings of high-grade contractors and architects and compare them with similar work of contractors of less ability. The specification writer learns much of workmanship by observation. I think this covers most of the important aspects of materials and workmanship.

Preparing the Specification

I want to talk about my method of building specifications from the working drawings. We might at this point consider carefully that the specifications do not serve the architect particularly but that they concern the contractor, estimator, material man, architect's superintendent and manufacturer. Therefore, in writing specifications, these men should constantly be borne in mind. When plans and specifications are ready, the contractor is summoned, given prints and specifications, and is requested to return with his bid at some near future date. If a satisfactory figure is to be obtained, every consideration must be given to the contractor to facilitate his work by describing the work in the most intelligent manner, and fully describing materials in detail as to quality and construction, leaving nothing in doubt. I might mention that I go this far—I refer to catalogs and settle any doubts by referring to an article by its trade name. There have been some questions raised as to this method, but why not refer to an article by its trade name—it saves the estimator a lot of time in looking up catalogs for a thing that fits the general specifications.

I keep in constant touch with the chief draftsman, and when the drawings are approximately 90 per cent. completed, I secure a set of prints and a tablet, on which I make a list of general headings in alphabetical order as they occur, placing the name in the lower right-hand corner, and leaving about two or three blank sheets after each alphabetical heading, bearing in mind the trades engaged in the work.

In dealing with materials which enter into the work, I select my material and place a note on the drawings as to which material has been decided upon, making sure that the information is placed on all sections and in plans and elevations to explain the work more thoroughly. I do not allow draftsmen to place notes on the drawings; in fact, it is absolutely forbidden in our office unless they are requested to do so by me. These sheets of notes which I make are to be kept as record sheets, and my idea in doing this is to avoid conflict after collecting materials in their proper headings on these sheets. After collecting these various materials properly, I assemble the sheets in the order I wish to classify the specifications, numbering with red pencil the notes in the order I wish to call attention to them. I then proceed to dictate the first draft of the specifications, requesting the stenographer to leave plenty of margin for corrections and additions. These sheets I treasure.

Method of Handling

In the first paragraph of each heading I call attention to the general conditions. Following this are notes such as alternates, allowances, etc., calling the contractor's attention to items specified in other branches of the work, and under these particular notes the question of hoisting materials is decided. We usually specify that the contractor must hoist all materials at the building or furnish hoist and power, and the sub-contractor is to place the material on the hoist and remove it at the proper floor level. The sub-contractor readily sees he has nothing to do with his material but bring it there and deliver it to the hoist.

The question of work, or scope of work, or work included, is next discussed. The estimator's attention is called to all work specified under this particular heading, placing it in the order as I have numbered the items in red pencil on my notes. The various materials are assembled in order so that when the contractor takes off his quantities he finds his materials all listed in one place and not scattered throughout the specifications.

I next mention workmanship, stating the quality of work we expect in the type of building to be erected, and bearing in mind that a warehouse is not a hotel or a residence and should not require the same quality of workmanship.

Following workmanship, I treat the items under extent of work and describe in detail materials and methods of construction. In carpentry I include the work in general pertaining to carpentry specifications; then from my list of notes explain in detail materials and workmanship in various items. I may discuss the joists and describe them in detail, but I try as much as I can to follow the job through as the work progresses in the building. The estimator likes best to take it off that way.

Under cabinet work, marble work, tile work and similar materials, I specify general items under their proper heading, such as trim, base, architraves, picture moulds, etc.

New Type of Underfloor Duct System

Provides Electric Service with the Least Expense and Maximum Flexibility of Distribution—Arguments For and Against the Scheme—Opinions of Architects, Engineers and Contractors

"Electrical World" reports that buildings, representing an investment of more than $62,000,000 have been erected since 1920 or are now under construction which embody a relatively new underfloor distribution system that in the opinion of some architects, engineers and contractors solves long-endured and perplexing problems. Some industrial plants in the design stage will also incorporate this new feature. The lowest-priced building which now embodies this system cost $100,000 and the highest-priced one cost $15,000,000. Despite the density of floor distribution in the twenty-two buildings, records of bids on the electrical work indicate, according to "Electrical World," that the average cost for the underfloor system was only 0.64 per cent of the building cost. According to the engineers and contractors who favor it, its economy is largely due to the low unit price of the material used and the ease of installation. They point out that it affords flexibility of distribution that has never been obtainable with any other system at so low a cost. This and other merits claimed by the advocates of the system are disputed by some firms and individuals. The interests of all from whom opinions can be obtained are so diversified that at this time no more can be done than to describe the system and record the arrangements for and against it. The system will have to stand or fall on its merits, and these can be proved only by experience.

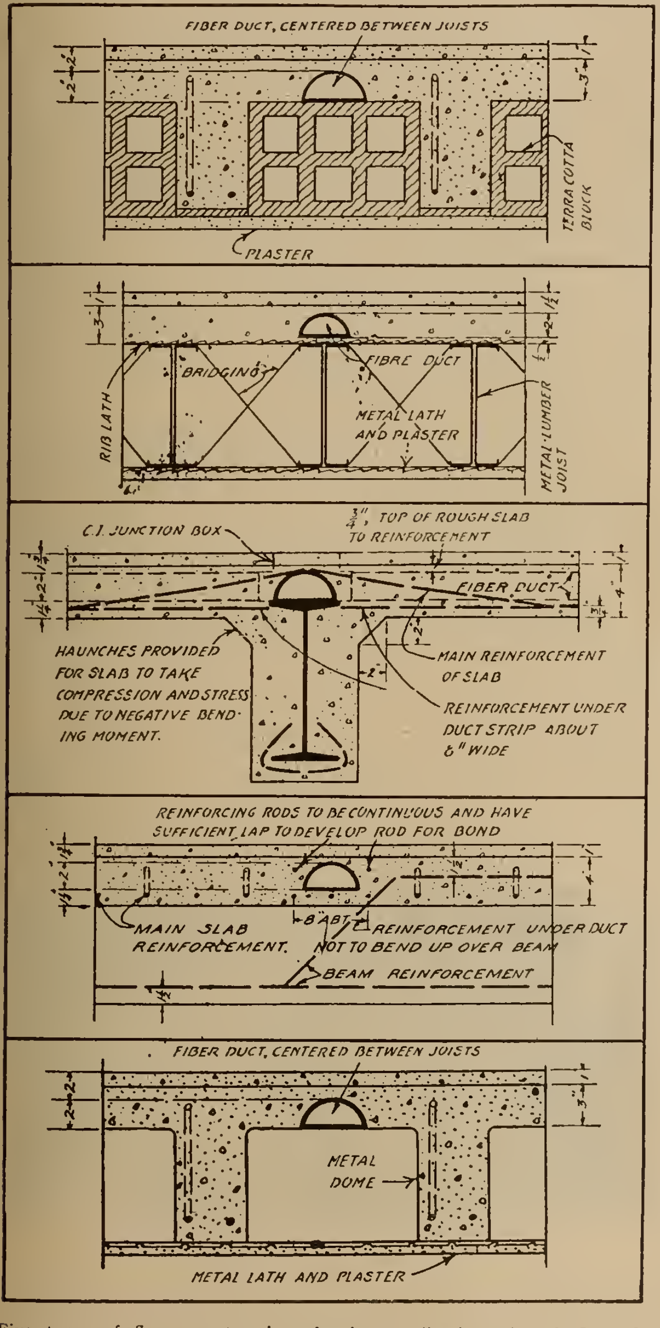
Methods in General Use Are Unsatisfactory

For years architects and engineers have been confronted with the problem of installing sufficiently flexible systems of floor distribution for light, power and signal circuits to care for future requirements. Of late the problem has been aggravated by the tendency toward open offices, with the consequent uncertainty of desk location, and by the need in industrial plants of changing motor locations or feeder circuits because of changes in production processes, new ideas in motorization and growth of industry. With concealed systems of distribution which have been used in the past it has been found expensive to provide a system that will adequately allow in advance for these changes. Consequently, when outlets had to be relocated it was often necessary to remove the floor covering, channelling the concrete to accommodate the new circuit or adopting some less desirable expedient. As a result, office or plant operations had to be distributed or the change-over undertaken during non-working periods. Even where the initial requirements have to be met, the floor construction often had to be held up until a final decision could be made on services. This frequently results in considerable friction or misunderstanding between the contractor and the client.

In general, the new system consists of a grid, loop or any other preferred arrangement of half-round fiber ducts connected at intersections by junction boxes which are merely laid in position (not actually attached to the components of the system) and the whole incorporated in the floor fill so that outlets can be placed at the beginning or after the floors are completed. Either single-ducts or double-duct systems can be installed, depending on whether the electric power and signal circuits are grouped in the some duct or separated. If the latter is done, both types of circuits can be made available at closely adjacent points without the complexity of grid crossings by using interlocking grids, one for power and one for signal circuit.

Placing of the Ducts

In this grid of underfloor ducts the backbone of each grid serves as a header, while the ribs or branch ducts at right angles to the header extend to the floor wiring centres. Access to the duct is obtained through inserts or outlets placed at the start or after the floor is finished. If placed first and subsequently abandoned they may be easily closed in a simple manner, being, however, immediately available again if wanted. Usually in laying out the system one duct is run parallel to the outside wall of the building, about 3 ft. to 3½ ft. therefrom, and other ducts laid parallel thereto at intervals depending on the flexibility of service desired. Maximum flexibility can be obtained by placing them 5 ft. apart because in this position any desk is bound to come over one of the ducts. Headers are spaced solely on the basis of estimated wire density (20 ft. to 40 ft. apart), as the wire can be snaked any distance met with in ordinary modern buildings.


FIBER DUCT, CENTERED BETWEEN JOISTS
PLASTER
TERRA COTTA BLOCK
BRIDGING
FIBRE DUCT
RIB LATH
METAL LATH AND PLASTER
METAL-LUMBER JOIST
C.I. JUNCTION BOX
¾", TOP OF ROUGH SLAB TO REINFORCEMENT
FIBER DUCT
HAUNCHES PROVIDED FOR SLAB TO TAKE COMPRESSION AND STRESS DUE TO NEGATIVE BENDING MOMENT.
MAIN REINFORCEMENT OF SLAB
REINFORCEMENT UNDER DUCT STRIP ABOUT 6" WIDE
REINFORCING RODS TO BE CONTINUOUS AND HAVE SUFFICIENT LAP TO DEVELOP ROD FOR BOND
MAIN SLAB REINFORCEMENT.
8 ABT.
REINFORCEMENT UNDER DUCT NOT TO BEND UP OVER BEAM
BEAM REINFORCEMENT
FIBER DUCT, CENTERED BETWEEN JOISTS
METAL DOME
METAL LATH AND PLASTER

Five types of floor construction showing application of underfloor duct system

It is the claim of the architects, engineers and contractors in favor of the system that it is adapted to any medium or high-class fireproof floor construction where there is sufficient fill for service systems installed in the normal way; that is, where there is 4-in. to 5-in. fill above the concrete slabs. In such cases the foreign piping must be installed below the upper 3-in. stratum to avoid cross-overs. Where this is impossible it is suggested that the foreign piping be moulded in the slab or grouped where possible and the concrete slab channeled to accommodate it. Where this is impossible special cross-under fittings can be used in connection with the underfloor duct system. With proper co-operation of the building constructor it is possible to place the fiber duct in the neutral axis of the slab without weakening it.

Concrete Pads

Where there is sufficient fill above the concrete slab to accommodate the underfloor duct system as well as the foreign piping, concrete pads are laid on the slab in grid formation with their upper surface at least 3 in. below the surface of the floor. Where single ducts are to be placed on them they need be only 8 in. wide, while for double-duct systems they should be 13 in. wide. The operation of laying these pads is relatively simple. According to figures kept on an installation, 100 ft. of concrete pad can be laid and finished in two and one-half hours. This refers to the double-duct pad 13 in. wide. The cost of these pads, including material and labor, amounts to 10 cents to 15 cents per lineal foot for single-duct pads and about 15 cents to 20 cents per lineal foot for double-duct pads.

Where it is impossible to prevent the foreign piping coming above the surface of these pads by any of the expedients mentioned previously—and this occurs very infrequently where laying of the underfloor duct is co-ordinated with the building construction in advance—a gentle slope of cement can be built over the foreign piping where it does not extend too high to facilitate snaking the conductors over it. In such cases the conduits would be cut to conform with the obstruction. In many cases if interference of this character were to be met with, the concrete pad would usually be built with its surface a less distance below the element floor level and smaller fiber duct laid on top of it.

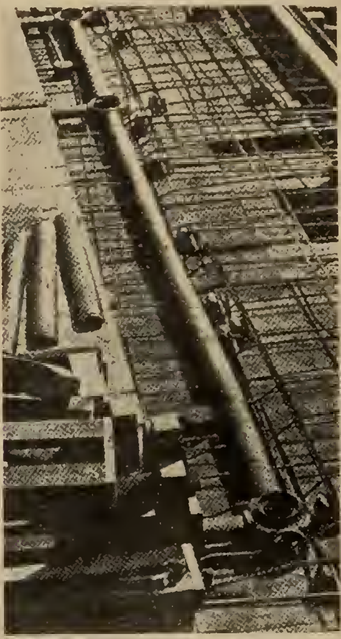
After the concrete pads have set, junction boxes are laid at each intersection of the pad and the lap-joined fiber duct is placed on the pad about as fast as they can be laid. The operation does not require much skill, it being necessary only to line up the junction boxes and ducts so that after the floor is finished the junction boxes will give an exact indication of where the ducts are placed in the floor.

Keeping the Ducts in Place

To keep the ducts and outlet boxes in place awaiting the pouring of the floor fill various methods have been employed. For example, tie wires have been cast in the concrete pads, plaster of paris or cement has been used to incase the ducts, but the most economical and desirable method is to pour hot roofing pitch along the edges of the duct and the junction boxes where they meet the concrete pads and over the joints between ducts and also where they join the junction boxes. When this pitch sets it holds the ducts and junction boxes very firmly in place and also serves to exclude moisture of the floor fill when it is poured. One contractor finds that 9.6 cents per lineal foot of duct is a conservative figure for laying the ducts and junction boxes, where boxes are placed every 40 ft.

There is some debate among users of the system whether the floor outlets should be laid before or after the floor is completed. , Those in favor of placing the floor outlets in advance claim that it can be done more quickly and with less expense, whereas the other side maintains that because an outlet can be connected with an underfloor duct in a finished floor in such a short time, it is advisable to install them afterward.

If the floor outlets are installed in advance of the floorfill, the underfloor duct is tapped at the point where outlets are desired and the outlet is threaded into place and protected from injury. According to experience on actual installations, floor outlets have been installed in finished floors in twenty minutes. This includes the time of cutting the linoleum, drilling the concrete floors, cutting the fiber duct, screwing the outlets into place and grouting in position.


Underfloor duct to be cast in floor slab

Before the floor fill is poured it is necessary to level the upper part of the junction boxes, whch lie flush with the floor surface. This is relatively easy to accomplish because of the adjustment provided in the surface of the box, but it is the one job which requires the most skill. Some building contractors take advantage of these leveled outlet boxes for determining the surface of their floors.

While no serious trouble has been evperienced on existing installations with moisture from the floor fill seeping into the ducts and accumulating in the duct ways, the users of this system prefer to allow a reasonable time between pouring of the floor fill and pulling in wires in order that any moisture which might collect may evaporate or be swabbed out in case this operation is necessary. On account of the cross-section of the ducts, evaporation is greatly facilitated and swabbing is very easily accomplished.

Capacity of the Ducts

With a cross-section of more than 6 sq. in. in one of these half-round fiber ducts it is geometrically possible to accommodate as many as forty pairs of rubber-covered wires in one duct. However, this capacity, even if practically obtainable, is never needed in the most congested office buildings. Half-round 4-in. ducts are used in most cases to facilitate location of them after the floors are laid. Smaller ducts can be and have been used where desirable. In industrial plants where large circuits are required it is possible that ducts even larger than 4 in. might be provided. Because of the cross-section of the underfloor duct system, it is decidedly easier to fish and snake wires and cables than in systems of smaller cross-sections. Though no tests have been run to determine the maximum speed of installing wires, 100 ft. per hour have been easily snaked and pulled under normal working conditions. In one installation eight armored cables have been pulled into half-round 4-in. underfloor ducts, and it is claimd by some contractors that as many as ten can be pulled in without crowding the capacity of the duct. In another installation fourteen pairs of telephone wire and three forty-pair telephone cables were pulled into one duct.

Abrasion of the insulation is not considered a serious factor because the conductor is not subjected to any more abuse than if it were pulled out on the cement floor for measurement prior to being pulled into an ordinary conduit system.

According to records of several contractors, the cost of installing this underfloor duct system exclusive of wiring is between 40 and 50 cents per lineal foot for single-duct systems. This is based on having junction boxes about 40 ft. apart and on metropolitan conditions where the cost of a journeyman electrician and helper amounts to a little more than $1 per hour.

Inability to accommodate this system in certain floors is an objection raised. Certain limitations are recognized by the advocates of this system and have been discussed in the early part of this article

System is Flexible

Some engineers raise the point that the system would not be economical not desirable where each floor is divided into separate offices by partitions or where a floor is rented instead of being occupied by the owner. While the advocates of this system recognize its maximum advantages in connection with open office spaces and industrial plants where flexibility of distribution is essential to allow for future changes of outlets, they contend that even many partitioned offices may be economically served from a simplified underfloor duct system which would consist chiefly of trunk lines with branch circuits of metal conduit extending to the individual offices. It is also contended that no office building owner can be sure that

Intermeshing double-grid system

partitions will stay in the same place during the life of the building or that the owners will occupy only those floors which they set aside for themselves in the beginning. Hence the flexibility of the system may be desirable even in these cases.

The cost of the underfloor system is raised as another objection. From the costs which have been quoted readers can decide for themselves, remembering that this system is not advocated except where flexibility and congestion of service require that ducts be provided having capacity equal to or greater than that of two ¾-in. conduits.

Some Objections That are Raised

The fragility or fiber duct is feared by some, but the wastage due to rough handling is not great because broken ends can be sawed off and the remainder still joined in the usual manner. According to experience, the only breakage comes from very rough handling. The breakage of the duct while in place awaiting floor fill is negligible according to experience on an installation where 12,250 ft. of duct lay exposed on the concrete pad for two weeks without breakage, despite the fact that workmen were walking over the ducts and boards were laid across them on which to roll wheelbarrows.

Liability of the fiber duct to crack or spread when the floor fill is tamped is another possible objection. However, the users of underfloor duct systems point out that floor fill is not ordinarily tamped, since it is poured in place, being in liquid form, and leveled off with a straight edge. Furthermore, nothing but the roughest abuse in tamping could cause the trouble anticipated.

Weakening of the floor surface is feared by some skeptics. While hairline cracks occurred over some early installations of ducts which were insufficiently covered with cement, this trouble has been eliminated by specifying 1 in. as minimum cover. Where this is impossible chicken wire or expanded metal over the duct have been found beneficial. Tests have shown that heavy safes can be rolled over the finished floors without injury thereto.

Seepage of moisture and chemicals from the concrete fill into the duct-way is feared by some contractors, but others who are using the system maintain that if ordinary care is employed in sealing the edges of the ducts and junction boxes where they join each other and touch the concrete pad, especially by the pitch method, what little moisture will enter the duct-way will readily dry out or can be swabbed out. Several contractors who have been installing the system say that no serious seepage occurs. The possibility of leakage of water through the floor boxes is present in every installation and is believed to be no more hazardous in this system than in others.

Objection to running both power and signal circuits in the same duct is raised by some, but such construction is not necessary if the double-duct system is used. However, it may be pointed out that power and signal circuits have been installed in the same duct in at least one large installation. In most cases power circuits are run in armored cable, although one installation is now being made where ordinary rubber-covered wire has been allowed for both power and signal circuits.

The Question of Grounding

Absence of a grounded inclosure for the circuit is advanced as an objection by some interests, but some representatives of the Underwriters have pointed out that the only reason the code requires grounding of conduits is that the conduit itself is a conductor and will become alive and constitute a life or fire hazard if a conductor comes in contact with it. In the underfloor duct system there is no metal inclosure, hence there is no need of grounding even if there were the opportunity. The same interests expect that the concrete inclosing the duct will be of as great protection against fire as metal conduits, if not greater. At present the junction boxes are not grounded, although they could be. It is pointed out by certain insurance interests again that the situation is almost comparable to that of a toaster or flatiron in which the metal part is not grounded but still liable to contact with an electric circuit. Others maintain, however, that the outlet boxes are more liable to contact with the circuit because of the possibility of water and chemicals getting into the junction box when floors are being mopped.

Some contractors point out that the underfloor system is not adapted to wall construction. This is admitted by its advocates, but they point out that metal-conduit systems in the walls can be tied in with the underfloor system very easily and to advantage.

The flexibility contemplated by this system is not necessary, in the opinion of some, and imposes a yearly carrying charge which would be greater than the expenses of making extensions to ordinary systems. However, in view of the changes necessary in outlet locations in open spaces, whether offces or factories, and the uncertainty of where these outlets will be needed, the advocates of the system maintain that only time can prove whether the inflexible or the flexible system should have been installed. In many cases which can be cited the cost of the flexible system could have been more than paid for by the cost of changes.

It is feared by some that when extensions or changes in circuits are to be made with the underfloor system the armored cable lying in the duct will be hooked up through an opening in the floor, with possible damage to the conductor, and that the joints will be made without soldering or taping. However, it is maintained by the other side that this possibility exists in any installation. The logical thing to do would be to run a new circuit from the new floor outlet to the nearest junction box.

Combustibility of fiber duct and the possibility of producing dense smoke are other objections raised. However, the advocates of the underfloor duct system have conducted tests which show great difficulty in igniting an installed duct by short-circuiting branch circuits owing to the small wattage involved, the concrete inclosure, and the absence of air circulation.

Not His Fault

This story was brought out during the work now going on in connection with the erection of a well-known factory. The new foreman being a hustler and wanting to make a record for himself, caught one of the brick masons snatching a bit of rest in the shade of a wheelbarrow.

"What do you think you are getting paid for? Get on the job if you don't want to get fired," he remonstrated.

"All right," drawled the mason; "but I can't see what all the rush is about. Rome wasn't built in a day, you know."

"That may be," was the foreman's rejoinder, "but I wasn't foreman on that job."

For the Building Supply Dealer

Have Built up Business by Giving Service

Frank Ryan & Co., Toronto, Have Steadily Grown in the Seventeen Years of Their Existence—Have Improved Facilities

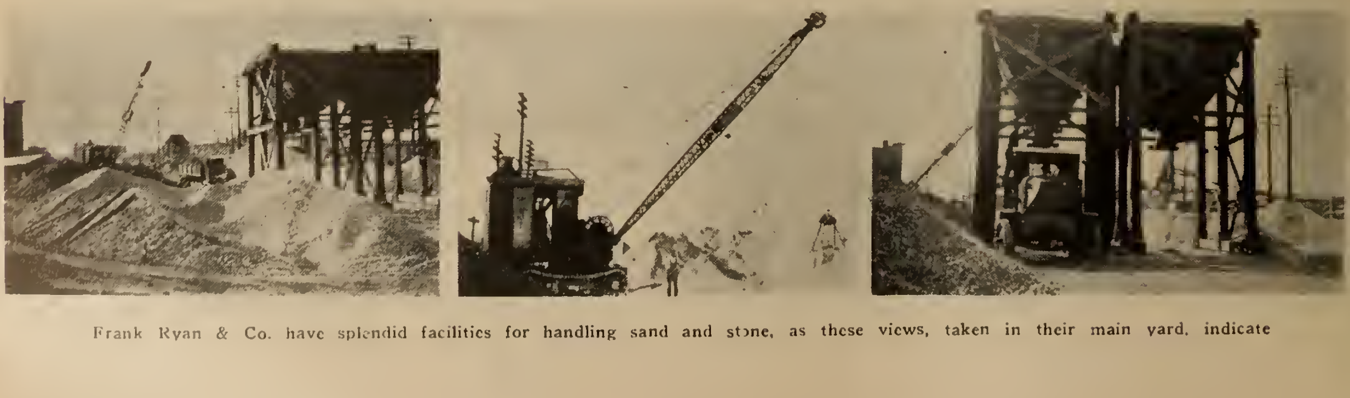
Seventeen years of sucessful business is the record of Frank Ryan & Co., dealers in building supplies of 1327 Bloor St. West, Toronto, Ont.—seventeen years in which Toronto has increased in population by 110 per cent. and in which building has developed in like proportion. During the whole of the period the firm has not been known by the present name, although the business has been continuous. In fact, when it was first established in 1906, it was called Smyth & Ryan, but in 1918 the partnership was dissolved and the business carried on under the name of Frank Ryan & Co. The business has consistently grown and today the firm numbers among its clientele some of the best known and most reliable contractors in the city. In addition it enjoys a considerable local trade among house builders and other small-lot purchasers but this type of trade is largely confined to those districts of the city that can be economically served from the two yards of the firm—the main one on Bloor St. West looking after the western end of Toronto and the branch on Merton St.—established in 1908—caring for the rapidly growing North Toronto district. These two parts of Toronto have grown as no other sections have and Frank Ryan & Co. have been fortunate in being located in close proximity to take advantage of the tremendous building activity that has characterized both those portions of the city.

Attractive New Office

Frank Ryan & Co. long ago realized that their facilities were becoming inadequate for the business that was developing and so, in order to keep any of it from slipping away from them, planned some re-arrangement of their main yard. As a result of this decision, a new office building materialized and it certainly is a model to be emulated. While simple in style and finish, it is commodious, well arranged and attractive. There is nothing about it to prejudice the customer against the firm—none of the unsightliness or untidiness that seem to go hand in hand with so many building supply dealers' offices. Rather is there something clean-cut about the building that makes a visitor immediately impressed with the business-like atmosphere that seems to permeate through the whole plant. In location the office has an advantage. It is on the corner of a street at a street car terminus. Furthermore, the doorway is across the corner and not on the side. The result is that the entrance is more conspicuous than if placed in some other place. On the whole, therefore, the building may be said to be an ideal office for the supply dealer.

Mr. Frank Ryan

Consequent upon the erection of the new office, the yard was somewhat rearranged so that materials might be more efficiently handled. One important line that the company handle is crushed stone, gravel and sand of every kind for concrete and paving purposes. These come in on cars along a siding which runs the whole length of the yard. A recently installed Brownhoist crane with a clam shell bucket is used to unload the material either into stock piles or bins. Only those materials for which there is constant demand are loaded into bins. These were erected by Frank Ryan & Co. themselves to specifi-



Frank Ryan & Co. have splendid facilities for handling sand and stone, as these views, taken in their main yard, indicate cations prepared by the Brown Hoisting Machinery Co., and are capable of loading the largest size trucks in two minutes. Cement is kept in a suitable cement shed, while empty sacks are cared for in a separate building. Other supplies such as building stone, sewer pipe, drain tile, etc., are also stored, and in addition a big business is done in coal, for the handling of which proper facilities are available.

Delivery is an important item of any building supply dealers' business and in this respect Frank Ryan & Co. can give excellent service. Forty horses and seven trucks form the firms' own delivery force but it has been necessary, owing to pressure of business, to hire other equipment. One may readily visualize the extent of the business carried on by this firm from the statement that an average of ten cars of material a day are handled in the yard. Even this does not represent the entire extent of the firm's operations as a great many cars of material never pass through the yard but are sent directly to the purchaser from the manufacturer.

A neat, compact office greets the customer of Frank Ryan and Co.

A large part of Frank Ryan & Company's business is with the paving contractors, for whom the firm are able to supply complete requirements. Building contractors, of course, are large customers, while the city department of works and the Toronto Transportation Commission buy considerable quantities from Ryan's. Among some of the Toronto jobs handled by the firm this year were the Roncesvalles Ave. car sheds, Hillcrest yard of the Toronto Transportation Commission, additions to the plants of the City Dairy Co., Canada Bread Co., and Cutten & Foster, the Reception Hospital, the Administration Building of the University of Toronto, plant of the Bradshaw Paper Co., addition to Riverdale Collegiate, civic incinerator, and a warehouse for W. J. Pickard, Ltd.

Mr. Frank Ryan is head of the firm and manages its activities. The Merton St. branch is in charge of Mr. Skerratt. Sales are looked after by Mr. H. L. Conlin and Mr. Frank P. Ryan.

Competition in the Supply Business

While the number of building supply dealers in Toronto is large and in consequence, competition for business is very keen, this competition, according to Mr. Ryan, is not the cut-throat hook-or-crook manner of obtaining business that seems to characterize many lines of industry. Rather is the competition among building supply dealers a matter of giving service. Prices have been well standardized by the manufacturers and the dealers are careful, as a rule, to maintain them. If any cutting does take place the other dealers soon hear about it, and the result is that supply firms do not develop new business on the strength of prices that are lower than their competitors. Service is what counts and the firm that can offer special inducements in this connection is the firm that gets the order.

This is what has built up the extensive business of Frank Ryan and Co. in the past seventeen years, as Mr. Ryan himself has clearly indicated in these words: "Careful attention to the requirements and desires of our customers has built up our business. Prompt deliveries and other service features are important incidentals in making this policy effective. By adhering to a service principle we have established a good-will that is one of our most valuable assets."

Fire-Swept Town Being Well Rebuilt

(Continued from page 937)

a number of approved plans which are provided to builders without charge, but the builder is free, however, to submit his own plans and to build himself or employ a contractor.

The town is also undertaking some new extensions to its water distributing and sewage systems in connection with the reserved residential sections, this to comply with the new town planning scheme. The town of Aylmer possesses newly built waterworks equipped with electrically driven pumps with a subsidiary steam plant, and a modern water filtration plant, the latter built at a cost of upwards of $60,000.00.

Frank Ryan and Co's. North Toronto office and a portion of their delivery equipment

Hints for the Contractor

Mine Fire Cut Off by Open Cut

An underground fire burning in the Pittsburg seam of coal near Charleroi, Pa., adjoining the workings of the Youghiogheny and Ohio Coal Company of Cleveland, Ohio, bids fair to be extinguished after nearly a year of effort. The area of the fire, as nearly as can be determined, is approximately six acres.

All known means were tried, without success, to extinguish the fire. Finally, cutting the fire off by means of an open trench was resorted to. This cut is approximately 1,000 feet long, averaging 45 feet deep at the ends, within 50 feet of the crop, and running up to 65 feet of overburden at the center of the cut. It will average 65 feet wide on top and 25 to 30 feet in width at the top of the coal when completed. Material at the center of the cut lay in strata, approximately 15 feet being of yellow clay, 20 feet of hard shale, 12 feet of hard sandstone, 12 feet of hard slate, 3 feet of very hard sandstone and 3 feet of hard slate over coal.

Large cut in coal mine forms cut-off to underground fire

Drilling was handled with jackhamers and well-drills but the greater bulk was blasted with well-drill holes, using 40% dynamite. Cuts were made in very low lifts, chiefly on account of the cave-ins in old workings, as the cut is all undermined with old workings and very dangerous to proceed through with steam shovel. In fact, a shovel mounted on continuous treads only could be used. Effective drilling was difficult, because of many holes going through to old workings, the location of which could not be determined in advance, and the consequent loss of these holes for blasting purposes.

The contract for this work is being carried out by the F. E. Welsh Contracting Company, Inc., of Cleveland, Ohio, and has been in progress since Feb. 10th, in which time about 70% of the total yardage of approximately 80,000 cu. yds. has been handled. The equipment consists of an Osgood No. 29, 1-yd. continuous tread revolving steam shovvel, two four car trains of three-yard cars and two twelve-ton dinkies of 36 in. gauge. Work is carried on in two shifts of nine hours each, and yardage runs as high as 800 yards per day, the shovel handling material that often is too large to pass through the dipper. Large rocks are either chained to the dipper and loaded on the car or are cast back of the shovel to be jackhamered into sizes that will pass through the shovel dipper.

The upper 12 feet of clay was cast over the sides and the remainder hauled to waste at either end of the cut by the two dinky trains. The remaining 30% of material is all solid rock and hard slate, and progress is slow and difficult because of cave-ins and mine gas and gaseous fumes leaking through from the fire. Some of the material being loaded is too hot to handle with bare hands.

It is believed that this is the first piece of work of this nature to be undertaken by a contractor and also the first on which a small revolving shovel was used. The small shovel has proven its worth because of its flexibility of movement and its being able to go from place to place as the condition of fire warranted, moving, hauling or blasting.

To date the work has been carried on without accident, but the hazard is greater as excavation comes closer to the coal. It is hoped that the work will be completed in a few weeks without accident and in time to load out the coal so as to form an effective cut-off to the fire.

Supports for Heavy Machinery

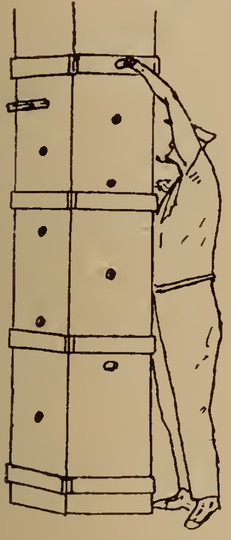
A plan to provide dependable support for heavy machinery was worked out in a new machine shop recently. This plan has proved much more desirable than the method usually followed for providing supports in reinforced concrete buildings.

The usual practice has been to string cast iron inserts either on a separate rod or directly on one of the reinforcing members, tacking or wiring them to the inside surface of the wooden molds so that bolt sockets will appear at regular intervals in ceilings, walls, or columns.

Often the weight of devices that are supported from these inserts is so great that the concrete cracks around the points where the inserts are anchored or the inserts breaks. If the insert breaks it is usually a difficult matter to renew the bolt anchorage. Frequently it is necessary to take down the brackets, chip out the concrete, put in a hook bolt around the insert rod or the reinforcing member itself, and secure it with sulphur.

When this particular machine shop was built, holes were bored through the forms and pipes slipped through them, spaced one foot down each face of the column, as shown in the sketch. The pipes were cut one-half inch shorter than the distance through the column form. A nail was driven into the form at each end of the pipes to prevent them from slipping out or falling inside the form.

When the forms were removed, the ends of the pipes protruded ⅜ of an inch—the distance they had rested in the holes bored in the forms. An oxy-acetylene torch was used to cut off these protruding ends where it was necessary that the face of the forms be smooth. However, since most of the brackets, starting boxes, and cranes fastened to the columns had a 2-by-8-inch wooden cushion between them and the face of the column, it was usually possible to bury the pipe ends by counterboring bolt holes about half an inch deep in the wooden cushions, so that there was very little cutting needed.



Pipes were slipped through holes bored in the forms before they were poured. Dependable supports for heavy machinery were available when the columns were finished—a steel-lined hole down every foot on all four sides of the column.

Pipes were cast in one direction only, in the outside wall columns. As the wall-panels were set almost flush with the inside faces of the wall posts, there was nothing to be gained by putting in pipes crosswise, as they would have been unavailable for any useful purpose inside the building.

This plan proved a great convenience. A steel-lined hole through the column, capable of receiving a ⅞-inch bolt, was available down every foot on all fur faces of the inside columns, and down every foot of the centre line of the wall posts.

Abuses of the Highways Before Completion

Mistakes that Are Frequently Made and which Militate Against the Success of the Road

While highway construction is rated as one of the large industries of the country there is a lack of co-operation among the several interests involved, which results in an unnecessary added expense. This can best be corrected by recognizing the several component parts of the industry, and by standardizing as nearly as possible the products used and methods employed.

There are frequently abuses in connection with financing, design, and construction of our highways. Some of the more evident of these abuses are:

Making the term of bonds longer than the life of a pavement.

Failure on the part of the engineer to provide a design and type of construction to meet the requirements of modern traffic.

Faulty construction on the part of the contractor for personal profit.

Inefficient inspection due to lack of knowledge, and to insufficient salary being paid to attract capable men.

Acceptance of inferior work.

Permitting inferior material to be substituted for that specified when delays are brought about by conditions beyond the control of the contractor.

Sacrificing quality for speed.

Failure to provide for a satisfactory well marked and maintained detour during the period the highway is under construction.

Designing and building bridges for a live load less than that for which motor vehicles are licensed and narrower than the graded width of the highway.

Failure to provide for the elimination of railroad grade crossings.

Designing underpasses with a head room less than fourteen feet in the clear.

Lack of co-operation on the part of public utility companies and municipalities. The highway departments should advise all interested utility companies and municipalities as soon as a highway project is decided upon, and these interested parties should immediately proceed to perform all necessary sub-surface work thereby eliminating delay in the progress of construction and the necessity for opening the pavement in the near future.

Absence of caution on the part of bonding companies. Bonding companies becoming surety for inexperienced persons who are operating under the guise of contractors or construction companies jeopardize the interest of the municipality engaged in highway construction. They should limit the surety to a fixed amount for the first contract, increasing the surety on the second contract, and so on until the applicant establishes his responsibility for carrying out contracts of magnitude.

The tendency of contractors to bid too low. This fault has had more to do with the performance of inferior work than any one other cause, and inexperienced contractors just entering highway construction are chiefly responsible, yet the bonding companies wil go on their surety just the same as they will for experienced contractors.

Use of inferior material. Competition in manufacturing or producing material used in construction is such that inferior material is frequently put in competition with satisfactory material, and by under selling is used in the work. In many cases where inferior material has been rejected by engineers and officials they have been charged with favoring some particular material or product for reasons other than its merits.

It has been definitely determined that excessive use of water in mixing injures the quality of concrete, yet in many cases engineers, contractors and inspectors still permit the use of excess water. The contractor permits it because his force can turn out more work, and he claims it just as good. The inspector tries to remedy matters, but is unsuccessful. The chief engineer cannot see all the work, and a subordinate in carrying out his chief's desires is accused of retarding the progress of the work. However, anything that tends to add unnecessary cost to the construction and maintenance of the highway should be considered an abuse just as much as should a violation of the provisions set down to protect it.

Overlooked Items in Estimating Road Work

Factors Affecting Costs Whose Neglect or Improper Evaluation in Estimating Turn Theoretical Profits into Practical Losses

(Continued from last issue)

A common oversight in estimating is the careful appraisal for the period of operation of the supply of labor, and, as determined by this supply, the trend of wages. Last year road contractors who put in early-season bids, underestimated the season's average rate of wages. One wonders if they have not done so again this year. It is true indeed that wages and labor supply are hard to foretell, but the wise bidder will make some attempt at a valuation of both.

Some of the questions to which answers need to be secured are: Is there a local supply of labor? Is this supply normally consumed later in the season? Will there be other local construction operations to compete? Is the labor resident or transient? Are there nearby large cities to draft labor, to reflect quickly wage changes, to magnify union influences and to encourage unsteadiness and turnover? Are there living accommodations for imported labor? Finally the general market for construction labor has to be taken into account. It is to be noted again that it is the average wage rate for the period of the operation that the estimator needs to know.

Experience and training are other factors in the labor problem by which costs are affected and, therefore, prices must be determined. Is the work to be done with an old experienced organization, or by a new organization created for the operation? The latter circumstance will increase the labor cost by a material percentage, particularly in the early stages of the work, (1) because the untrained crew will be longer in getting the outfit ready and squared to estimate-earning work and (2) because it will turn out smaller volumes until it becomes trained.

It should be borne in mind that, in a rising labor market, labor costs always increase in greater proportion than do wages, due to decreased efficiency of production. Tables kept by one contractor last year showed that, for every 10 per cent increase in wages, there was an increase of 16 per cent in the labor cost of production. It will be immediately apparent that this is a factor of vital significance to estimators and failure properly to evaluate it has made unprofitable many contracts taken on an apparently profitable basis. An additional factor, difficult of even approximation and, oftentimes, entirely overlooked, is the expense resulting from labor turnover in those years when there is a scarcity of labor and an almost constant necessity of breaking in "green" men in place of experienced ones. While hard to estimate, this may be a prolific source of expense. On one road contract last year, where the average working force was less than 100 men, more than 800 men were actually employed during the working season. Indirect or overhead labor, such as superintendence, office force, unloading, repairing, setting up, moving and removing equipment, is an item of expense easily underestimated, particularly where there is any possibility of failure to complete work within the time estimated.

Transportation

The old habit of expecting railway transportation to be adequate has, in the last few years, been pretty well beaten out of contractors. Embargoes, car shortages, strikes and other influences of general operation curtailing railway service are being discounted. Local drawbacks are more commonly overlooked. This is unfortunate because these are the ones which it is most within the power of the contractor to appraise and overcome.

Some of the contingencies in transportation to be regarded are whether service is by a main or secondary or branch line; what the frequency and time of train movements are; whether the direction of light train movements is that in which job shipments will come; whether the local car and general freight-handling facilities are good; what additional sidings, unloading spaces and car moving equipment will be required; what the road conditions are to and from unloading points and railway distances to supply points.

Train movements are of vital concern. Carload shipments must be by regular trains and the frequency of these and when they come in determine arrangements which have to be made for receiving shipments. Generally secondary line service is best if the freight originates on the line; main lines are more apt to be crowded with higher classification freight which will receive preference, and branch lines have fewer available trains. Also generally better service is had if the shipments are in the same direction as light freight movement. The local carload freight handling facilities determine what the contractor will have to provide in the way of sidings and how much shunting and shifting he will have to do. Generally lack of means of handling shipments increases both the cost of receiving service and the inevitable demurrage charges.

Roads are another factor in transportation costs that frequently are overlooked with disastrous consequences. Not only the roads for getting materials to the operations of construction but roads to and about the unloading yards and even to the town and railway station where supplies are got and small shipments arrive have to be considered for all conditions of weather and with the loads to be hauled in mind. Underestimated costs properly to maintain roads serving the job have cut the paper profits of many a highway contract.

Materials

Taking the lowest bid for materials as a basis for estimating without knowing whether the dealer or producer can deliver as fast in the amounts wanted as is required and whether the material is of a quality that will be accepted by the inspector is a common error. Quality and regular delivery are the paramount considerations and the price should be fixed on this basis. On materials not bought on contract, a price has to be estimated with due regard for the probable trend of the market. Other items are the cost of storing, shifting and rehandling materials, and waste incident to these operations as well as to damage and accidental loss which cannot be avoided. Failure to provide waste insurance in the estimated prices of materials cuts into profits. It is pertinent to note here that adverse railroad conditions in recent years have strikingly demonstrated that stocking and rehandling large quantities of materials is less expensive than delays often resulting from lack of materials. Liberal allowance should always be made for stockpiling and rehandling expense which average experience indicates to be necessary for an uninterrupted flow of paving material to the job at all times.

Supplies

Proper consideration is not often given to the cost of supplies. Individually the items may be insignificant but the total always runs into a considerable sum. An item easily overlooked here is the cost of repair parts and shop work for machinery, which will vary greatly according to age and condition of equipment. Besides the actual prices paid and the amounts required, there are freight and express charges and delivery expense for all supplies. The cost of handling numerous small quantities and articles is a larger amount than one imagines until the figures are totalled. Any contractor will do well to prepare lists of supplies, for particular types of roads, using previous job records, and work out approximate figures for shipping and handling costs. Going over such details and figures, when an estimate is being made up, will often save an underallowance for supplies.

Plant and Tools

It appears to be a natural habit to underestimate these items of expense. Extra gangs, changes in plans and misjudgment in co-ordinating operations are contingencies that must be anticipated and all of which add to the stock of equipment and tools required. As an example, the failure of a planned water supply may require additional development, pumping outfit and pipe line. Plant depreciation is one of the most troublesome items for the estimator and one on which there is room for considerable divergency of view. Where a contractor has been forced to make large purchases and immediately encounters a falling market, it accumulates added significance. Under these conditions, the first cost of a heavy plant investment might drop 33 1/3 per cent during one season's operations. Assuming such a condition, the owner would be faced with a loss of one-third the value of his equipment, plus the depreciation upon the remaining two-thirds. Under these conditions, and under the small margin of profit on which highway work is bid, an otherwise profitable commitment might be thus turned into an unprofitable one.

Excavation Costs

Failure to study all excavation involved, in the field, and work out in advance of bidding an approximate classification of materials to be handled in grading foundations, ditches, borrow pits, shoulders, dressing slopes, refilling rock-breakage cuts, etc., as well as the relative cost of each type of work is common. Because of the difficulty and expense necessary properly to keep such costs, we find not only contractors' records, but the actual technical literature in existence on this particular subject, very barren. After all care and skill have been exhausted, however, we are still forced to admit that any estimate upon road excavation will, doubtless, vary more widely proportionately from the actual costs experienced than the estimate upon any other item in a highway contract. Under these conditions, one might think that contractors would proceed with more caution and be less inclined to flirt with the danger line, in bidding on this item, than on any other item of a contract, but no such impression can be justified by the history of costs in recent years.

It is quite common not to estimate even approximately on the amount of fence moving, sod clearing, scarifying and other items which may be included in the excavation price, not to approximate average length of haul or overhaul on excavation and borrow, not to recognize that, on most road construction in cuts, it is impracticable not to excavate the shoulders of the road and then replace them without payment for either operation.

Other Contract Item Costs

In the same category with these oversights in estimating excavation is the common failure, in bidding on masonry work, to recognize the great variation in the unit costs of labor and other expenses, as between bridges, walls and other heavy masonry and pipe head walls, curbing, gutters, etc. Such items as head walls, bridge parapets, curbing and gutters will be comparatively much more expensive than other heavier types of masonry, not only in labor but also in waste of material. As an instance of this, on a road built in 1920, the cost of rubbing down head walls, with labor at $4.50 per day, was found to be 30c. per cubic yard of concrete.

In fixing prices on varying sizes of curbing, gutters, etc., many bidders apparently fail to recognize the basic fact that the smaller the volume of concrete, or other material, per linear foot, the greater will be the unit cost of handling and placing a cubic yard; of handling forms, finishing, protecting, moving equipment; of ratio of material waste. The same is true of excavation prices in that they sometimes appear to indicate a premise that excavation for tile drain, curbing and other small items can be done as cheaply as grading where quantities are large.

The cost of materials for pavements is usually a large part of the cost of a modern highway, hence the importance of adding to one's bid an ample percentage to cover waste and the labor expense in handling that waste. In some instances, highway departments and inspectors still insist upon the right to reject materials after unloading from railroad cars, without compensation to the contractor even though the burden may properly rest upon the material producer. As producers almost invariably refuse to accept responsibility for paving material condemned after unloading, it is proper to add a percentage for protection against this contingency where it is likely to be encountered. In some localities, it is essential for a bidder to protect himself against arbitrary decisions as to proportions of paving and other materials. In one state, in recent years, it was estimated that an arbitrary decision requiring contractors to give compacted measure on cement and accept loose, unshaken measure on aggregates, cost the contractors over $100,000 in a single working season. Recognition of this hardship was refused and no legal means of redress was possible under the form of contract in vogue.

Care should be exercised not to overlook figuring shrinkage as between loose measure and solid measure in the construction of sub-base, broken stone base and other foundation courses.

In conclusion, it may be said that there is no "royal road" either to the best estimating or to preventing the disappearance of paper profits. To the close student of the subject, however, this fundamental thought should always suggest itself: No matter how many uncertainties may enter into the preparation of an estimate, the moment you eliminate or neutralize one of these uncertainties by careful analysis and study, you are correspondingly closer to the actual result than if you guessed at them all. As has been said before, no scheme will ever be devised or charts drawn so that a novice can make highway estimates. By the same token, nothing will be promulgated or known which will entirely eliminate the disappearance of paper profits. However, through use of brains, intelligent interpretation and application of previous costs, as well as a study and knowledge of conditions influencing costs, risks can be greatly minimized and a much more accurate and conservative result obtained than is possible by any other human method. Aptitude in estimating for all items of expense concerned in a job will have to be built on experience and study in the actual conduct of construction.

Encouraging Better Wired Homes

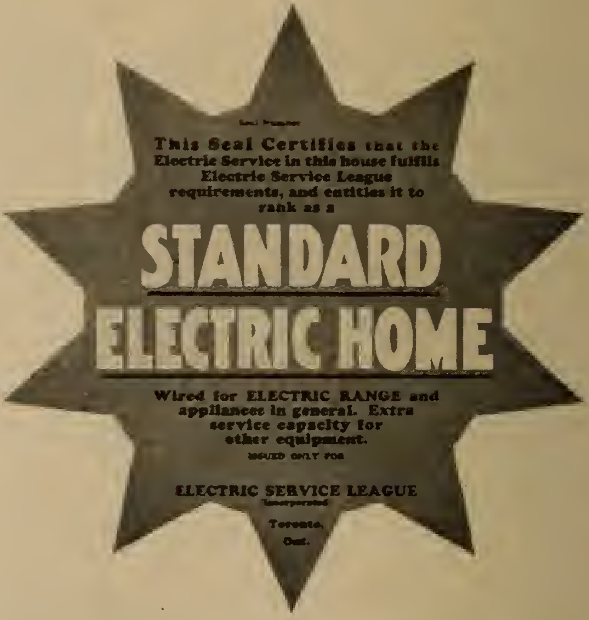
The Electric Service League is Planning a Campaign in the Interests of Houses with Superior Electrical Facilities—Red Seal to be Given to Contractors who Qualify

A movement which has considerable interest to house builders is the campaign which has been launched by the Electric Service League, Inc., on behalf of better wired homes. The Electric Service League, Inc., whose office is located at 24 Adelaide St. West, Toronto, Ont., is an outgrowth of the Electric Home League of Toronto whose success in staging two modern electrical homes is now a matter of history. By changing its name in this way the organization intends to indicate the broader nature of its future activities.

One important move of the League has been the appointment of a general manager in the person of G. W. Austen. Mr. Austen is a newspaper man of many years' standing, has had experience in organization work and has already given evidence of the great possibilities of service to the electrical industry which lie with such an organization as the Electric Service League. Plans are already complete for launching a vigorous campaign on behalf of better wired homes and in this contractors will be interested. It is an unfortunate condition in all centres where a considerable amount of building is going forward, that much of the electrical work is given very scant attention. Many contractors show little interest in the proper equipment of their houses for the use of electrical appliances beyond the extent to which such equipment will help to sell the home or enable them to sell at a higher profit. In the past it has been difficult to convince these builders, but since the staging of the two electrical homes mentioned above, the League has been called upon from time to time to give advice and offer suggestions. Out of this condition has developed a plan which will enable the builder, the electrical contractor, and the Electric Service League to work in unison.

The plan being developed by Mr. Austen at the present time, might be described as the "Red Seal Standard." A red seal will be presented to the builder of every home who wires according to a certain minimum specification outlined by the Electric Service League. The seal will be large enough to be seen at a considerable distance—about 18 in. in diameter. There will be a space below where the contractor will place his name and address.

While it is too early to say to what extent this campaign will assist in improving the standard of electric wiring, a number of building contractors have expressed themselves very enthusiastically about it. It is evident on the surface that if the standard of a considerable percentage of our homes can be raised to that outlined in the minimum specifications, the amount of business available for the contractor will be greatly increased. As the public, too, is brought to realize the value of these conveniences, they will little by little come to demand better installations, and the builders and architects will thus automatically improve their specifications.


Seal Number
This Seal Certifies that the Electric Service in this house fulfills Electric Service League requirements, and entitles it to rank as a
STANDARD
ELECTRIC HOME
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If interested in advertising value, ask for a copy of the A. B. C. statement of this paper.

Practical Hints on the Care of Wire Rope

Special Precautions Need to be Exercised if Wire Rope is to Give Maximum Service—Rules Which Should be Observed to Ensure Long Life

Wire rope is in itself the most reliable of all structural materials, but it is also a sensitive and complex structure. Therefore, in order to obtain the most satisfactory results from a wire rope, it is necessary to follow certain definite rules, and if these rules are ignorantly or otherwise disregarded, short rope life and often disaster is the result. Hence, by the application of a few of the more important rules by the user towards the care of wire rope, the abuse will be considerably reduced and better rope life will result. Such rules were given in a paper presented at the annual meeting of the Lake Superior Mining Institute by William Constable, mechanical and electrical engineer, Republic Iron & Steel Co. Contractors who make any great use of wire rope would do well to study these rules.

Hoisting and Haulage

The ropes used for this class of service range in sizes anywhere from 1 in. dia. to 2¾ in. dia. and lengths suitable to meet conditions.

Drums used for hoisting and haulage purposes should be made of cast steel material whenever a cast iron drum shows wear, and as large in diameter as practicable. The use of a grooved drum is far better and more economical than a flat face drum. Where a flat face drum is used it is absolutely necessary that the first layer wind uniformly to guide the additional layers because the first layer of rope on the drum is the groove for all additional layers. This can be greatly aided by using a steel starting piece to guide the first wrap of the first layer so that the rope may be wound on the drum in a true helix, otherwise the rope may wind in a wavy manner causing severe abrasion to the rope due to this condition.

When installing a new rope on a flat face drum, care should be taken not to hammer hard each additional wrap of idle rope against the adjacent wrap already on the drum. It is only necessary to tap with a light hammer and wooden block to bear against the adjacent wrap of rope. If this is done too forcibly it will reduce the pitch of the first layer by the interlocking of the idle wraps of first layer and the second and additional layers of rope will be subject to severe abrasion due to the close winding of the first layer. Furthermore, to avoid interlocking of ropes on installations winding only one layer on a small diameter straight face drum with a severe fleet angle existing, it is preferable to use a left lay rope when over-wind rope winds from right to left and under-wind rope winds from left to right. A right lay rope is preferable when the under-wind rope winds from right to left and the over-wind rope winds from left to right. There should always be at least three to four turns of dead rope left on a drum.

When severe rope abrasion occurs at flanges when changing from one layer to another, or at other points due to the crossover, it is advisable to order a little reserve rope to permit the cutting off of the rope at the drum end at frequent intervals. Where there is not much reserve rope on the drum and where the abuse is quite severe and requires frequent cutting at the drum end, it has in some cases been found satisfactory to cut 30 in. at a time every three or four weeks. In other cases these need not be cut oftener than three or four months. This will depend upon the total rope life and the rapidity of rope wear on the drum.

Grooved Drums

Where a grooved drum is used, and the rope wound more than one layer the pitch of the grooves should be not more nor less than ⅛-in. larger than the rope diameter; this will have an ideal winding condition of the first layer, if the fleet angle is not too great, and will permit a good groove condition for the second layer. If the pitch is too small it is apt to cause crowding or rubbing of one wrap of rope against the other and if a second or third layer is added on a close pitch groove drum the additional layers of rope will be subject to severe abrasion. The grooves should also be made of a slightly larger radius than the rope so that the rope will not wedge or pinch in the groove.

Another advantage of a grooved drum is that the rope in the groove is given a far better and continuous support, hence the actual pressure of rope on the drum becomes less and more uniform and not concentrated as when a flat face drum is used. It will be found that most of the latest high speed hoist installations are using grooved drums. It is the general practice for the diameter of a drum to be not less than 60 times the rope diameter.

Sheaves

The head sheave of a shaft hoist installation has a great bearing on the life of the rope and if they are not made of the proper material nor machined true and their upkeep is neglected, good rope service will not be secured. Sheaves are generally made of cast iron, cast steel, or manganese steel. If a cast iron sheave does not wear with any given rope tension, it will be satisfactory to use cast iron. If, however, the cast iron sheave wears so much as to influence the life of the rope a cast steel sheave should be used, but if a cast steel sheave wears so much as to influence the life of the rope, then a manganese steel sheave should be used if other operating conditions permit.

It is very necessary that head sheaves be machined very true, round and in perfect balance if good rope service is to be secured. It is also very important that the sheave is in alignment with the center line of the drum or if the drum is not entirely filled it should be in line with the center of that portion of the drum on which the rope winds, to avoid sheave flange wear as much as possible, which is caused by the rope fleeting back and forth across the drum. It is almost impossible to exercise too much care and attention for the prevention of side flange wear, but is also very dangerous if a portion of the sheave flange cracks and breaks out, throwing the rope out of the sheave groove.

With high speed hoists, the head sheaves should be as light as possible. Where a sheave of heavy section is used, there is a tendency for the ropes to slip on the sheave when the velocity of winding changes quickly which will wear the rope very severely. If sheaves become badly scored or the groove diameters are worn small from a rope which has been in service for a considerable time, it is most advisable to change the sheave or turn out the grooves before a new rope is installed, to insure the best condition for rope service in the future. A pinching groove condition should be avoided with a new rope as this results in a restriction of the rope rotation and the strand movement. The general practice is to have a groove diameter slightly larger than the rope diameter and the following groove diameters are recommended for new and remachined grooves:

For rope 3/4-in. to 1 1/4-in. dia. 1/16-in. larger groove diameter.

For ropes 1 5/16-in. to 2 1/2-in. dia.—1/8-in. larger groove diameter.

For ropes 2 5/8-in. up— 3/16-in. larger groove diameter.

In regard to the proper diameter sheave for a certain size rope, the general practice is to figure it at 72 times the rope diameter, but 80 times the rope diameter would be better.

Fleet Angle

The fleet angle is the maximum angle formed by a line running through the center line of the head sheave at right angles with the center line of the drum and a line running from the center of the head sheave to the center line of the outermost wrap of rope on the drum. This angle should be kept as small as possible. The permissible fleet angle for shaft hoists is stated by some authorities as a maximum of 1 1/2 degrees, but others allow 2 degrees as a maximum. These values are governed by a number of conditions, for example, a 2-degree maximum fleet angle may be permissible for large diameter grooved drums, but without question where a small diameter straight-faced drum is used a maximum fleet angle of 1 1/2 degrees is excessive. Too large a fleet angle results in an overlapping of the rope on the drum which should be avoided as it will mash, distort, and severely abrade the rope causing a short rope life. Many ropes have been decreased in life from thirty to fifty per cent. because of this condition. As the fleet angle is governed by many conditions, before installing a new equipment it would be very advisable to submit all data to the rope engineer for his examination, study and suggestions from a wire viewpoint.

Attachment to Cage or Skip

Where the rope is attached to the cage or skip it is most advisable to use a wire rope socket with zinc attachment which when properly made will develop the full strength of the rope. If a socket attachment is used it will be necessary to cut off the end of the rope at frequent intervals and re-socket it again. This should be done at six equal intervals during the life of the rope and the rope should be cut anywhere from 2 to 20 ft., depending upon the deterioration of the rope near the attachment. This is necessary because a rope running over a head sheave of a hoist is restricted in rotation due to the friction of the rope in the groove of the sheave. This accumulates an excess of twist in the rope at the socket. This accumulation of twist together with the constant vibration of the running rope, concentrating at the socket attachment, causes an additional fatiguing action in the steel wires which requires that this portion be cut off at frequent intervals. An additional length of rope should be ordered to meet the condition.

Where clips are used for an attachment, be sure that the "U" bolt bears on the slack side of the rope. Otherwise a crimp is placed on the tension side of the rope, damaging it and at this point the rope generally fails. Be sure to use a sufficient number of clips to properly hold the rope and the larger the rope diameter the greater number of clips are required. Clips should be spaced so that the distance between the center line of clips is equal to six times the rope diameter. It is very important that the nuts are tightened up frequently when the rope is put into service, because the stretch of the rope reduces the holding power and may cause an accident. It is also considered advisable to re-clip an attachment in case of resocketing. Where the clip attachment is used it is advisable to use a solid thimble so that the pin hole may be offset from the center line of the thimble a distance equal to one-half the rope diameter so that the pull of the rope may come in direct line with the bear of the pin.

In shaft hoist or haulage work, if a shut-down becomes necessary the rope should not hang in the shaft or lay out on the slope, but both skips or cages should be brought to the surface with the rope wound on the engine drums so that if thoroughly lubricated they will be protected from deterioration.

Haulage

In inclined haulage work a good track equipment is very essential. Care should be taken regarding the true alignment of sheaves and track rollers. These should be well lubricated so that the rope may ride with the least possible friction. Rollers often stop or freeze fast and though made of softer material will cause wear on the rope. Knuckle sheaves should be located at points where change of direction of rope is such that the length of the arc of contact is six times the rope diameter or more. The knuckle sheave diameter should not be less than 48 times the rope diameter for 6x19 construction, nor 84 times for 6x7 construction and should be equipped with properly machined grooves.

Abrasion and rubbing of rope on an incline haulage should be avoided by the proper installation of rollers. Considering the rollers on a uniform grade, it is found economical to use the wide mouth type of track roller, which should be not less than 6 times the rope diameter, and they should be spaced 25 to 30 ft. apart. If it is found that this system of track equipment wears down quickly it may be necessary to install steel sheaves.

In both hoisting and haulage work it is very important to avoid high accelerating stresses. It may not, on the surface, appear dangerous to the wire structure, but if the comparison were made of the micro-structure of the steel before and after such stressing a visible change would be perceptible. It is by far the wisest plan to apply the load gradually so that the rope may not be subjected to sudden stresses, which have a great bearing on the life of a rope.

Overloading a wire rope is also very detrimental toward good rope life and should be avoided and guarded against. The safety factor should not be less than that specified in the wire rope catalogs and for short lengths of rope the safety factor should be increased.

A good many of the most modern shovels today use wire rope exclusively for digging in place of chain which was formerly considered indispensable for shovel work. Ropes for this class of service range in sizes from ¾-in. dia. for boom ropes up to 2⅛-in. dia. for main hoist ropes, as used on one of the largest type.

Ropes on Excavating Shovels

When installing a new rope on a shovel care should be taken not to damage the rope in any way nor cause it to become kinked, for any abuse incurred by a shovel rope during installation may cause an early failure. After removing an old rope, and before installing the new one, examine all the sheaves carefully and check the groove diameters accurately to see that they have not been worn small nor scored by the old rope. A sheave groove which has been worn down to the diameter of the worn rope, which is generally less than the diameter of the new rope, will cause a pinching action on the new rope resulting in the new rope becoming damaged in the first few days of operation. It would be much cheaper to re-machine the worn groove to the proper groove diameter or replace the sheave before installing the new rope.

Avoid the rubbing of the rope on the steel structure of the boom by installing guide rollers. Where such rollers are installed the bearings must be kept well greased so they will always be free to revolve. If this is neglected and rollers become fast the ropes continually rubbing over them will severely wear the rope and shorten its life. Precautions should be taken against sudden heavy digging stresses as the normal load stresses run high in this class of work. Furthermore, a good operator will avoid reckless handling which is apt to impart severe damage to the ropes. The rope should wind uniformly on the drum and avoid the piling up of the rope on the drum in one place, as this will mash and abrade the rope and greatly reduce its life. It is also important where possible to have the drum of sufficient diameter and length so that the rope may wind upon it in one layer.

Seizings

As stated before, a wire rope is a mechanism of somewhat complex construction and its original efficiency can only be retained as a unit when it is not distorted. In the manufacture of wire rope great care is exercised to twist the wire in the strands and the strands in the rope under uniform tension. Therefore, it is very important that the ends of a wire rope are properly secured with the proper number of wire seizings. If the ends are not properly secured, the original relation of tension, as manufactured, will be disturbed and the maximum service will not be secured, due to the fact that some strands are carrying the greater portion of the load.

When cutting steel wire rope, it is very essential to place three sets of seizings each side of the cut to prevent disturbing the uniformity of the rope. Use annealed iron wire for seizing purposes.

Right and Wrong Way of Handling Rope

When installing a piece of wire rope it is not probable that anyone would intentionally mishandle it, nevertheless, a word of caution should be given. In the first place, a wire rope should not be handled like a manila rope for it is structurally different. It must not be uncoiled like a hemp rope. A wire rope received in a coil should be unrolled on the ground like a hoop and straightened out before attempting to pass it around the sheaves. Where long lengths of rope are shipped on reels the reels should be jacked up on a shaft at a point convenient to the installation and allowed to unwind slowly until the entire length of rope has been installed. Avoid kinking a rope when installing it, for if a rope is kinked during installation, it is almost certain to fail in service at that point.

When handling a Lang lay rope never wind directly from the reel or coil to the drum. Lay out rope in full length if possible or set the reel or coil as far from the drum as possible. A Lang lay rope is more springy than a regular lay and should be carefully installed and where possible always keep tension on the rope.

Lubrication

Lubrication of a wire rope is highly important, as it performs two necessary functions; that is, to reduce internal and surface friction and to prevent corrosion. Ropes being operated in vapors or fumes, or in water must be thoroughly lubricated to prevent corrosion. There is not much value in a lubricant which will run easily and drip from the rope. The ideal lubricant is one which will not harden upon exposure nor at low temperatures and which can be made thin enough to penetrate. Therefore, a lubricant applied hot will generally give good service because in its heated condition it will penetrate and then upon cooling will congeal into a plastic filler throughout the rope.

A wire rope operating over sheaves must be well lubricated because it is subjected to considerable internal friction and in order to overcome this friction the lubrication must be such that it will work in between the wires of the strands, thus permitting the wires to be free to adjust themselves to all degrees of bending.

Connections

Whenever a spliced eye, clip or clamp connection is used it is very necessary to use a wire rope thimble, around which the rope is passed to protect it from becoming mashed and distorted when strain is applied to the rope.

Reverse Bending

Reverse bending, that is, passing of a rope over one sheave in one direction and over a second sheave in the opposite direction, so that the two bends are diametrically opposite. This is an exceedingly severe condition of rope service and its use should be avoided wherever possible. The use of a reversed bend will wear out a wire rope more rapidly than straight bending. The result of a reverse bend is similar to taking a sample of wire and bending it backward and forward until it breaks at the point of bending. It is quite surprising how few reverse bends are required to cause failure, therefore, where a wire rope is subject to similar reverse bends short rope life will result.

Road Convention and Show in Chicago

Plans for the annual convention and road show of the American Road Builders' Association in Chicago January 14 to 19, 1924 are practically complete. The road show will be held in the Coliseum, the Coliseum Annex and the Greer Building, the same as last year.

Asphalt Men Meet

Brief Report of Recent Convention in Denver, Col., when Problems of the Industry were Discussed

One hundred and fifty public officials, engineers, contractors and material men from fifteen western states were present at the second annual paving conference held on August 21 and 22 at Denver, Colo., under the auspices of the Asphalt Association. The meeting was called for a discussion of asphalt problems and for the purpose of acquainting highway engineers and contractors especially with successful methods employed in laying and maintaining the various types of asphalt pavements. The first conference was held in Atlanta last year.

The Denver conference was opened by Joseph R. Draney, president of The Asphalt Association, and among the subjects discussed were: "Trend of Specifications and Design of Base and Wearing Courses," "Asphalt as a Paving Material," "Black Base," "Asphalt Paving Adjacent to and Between Car Tracks," "Utilizing Old Asphalt Pavements for Resurfacing," "Good Roads and Streets, a Civic Asset," "Selection of Types of Asphalt Pavements with Reference to Local Materials," "Asphalt Pavements on Slag Base," "Questions Involving Justifiable Expense in Asphalt Construction," "Wearing Courses for Bridge Floors," "Maintenance Methods and Cost," "Essential Test Data on Asphaltic Concrete" and "Asphalt Construction on Alkali Soils."

In discussing "The Trend of Specifications and Design of Base and Wearing Courses," Fred G. Simmons, state highway engineer of Oklahoma, vigorously condemned the practice of laying concrete roads without a wearing course of asphalt. He argues strongly in favor of the use of local materials and disapproved the policy of bringing road materials long distances which, he declared, greatly increases road building costs through added freight rates.

"Asphalt as a Paving Material" was the subject of an address by chief street engineer, John B. Hittell of Chicago. In his address, which was illustrated, Mr. Hittell touched on the occurrence, production and preparation of asphalt for use in highway construction, pointing out that at present 50 per cent of the asphalt produced is used for paving purposes.

"A considerable use to which asphalt has been put in the past," said Mr. Hittell, "as a binder in foundations for pavements, generally of an asphaltic type, may be greatly increased as the 'black base' or asphaltic type of construction, becomes more familiar to public officials and engineers.

Chris. P. Jensen, county surveyor, Fresno, Calif., in an address on "Black Base," produced documentary argument and stereoptican pictures advocating the use of asphalt concrete, not only for surfacing but for the base. He declared that the flexible asphalt pavement, although seldom more than five inches thick, has shown few failures.

In speaking of "Asphalt Paving Adjacent to and Between Car Tracks," John A. Griffin, city engineer of Los Angeles, Calif., described the successful development of a type of asphalt paving which is laid between street car tracks in Los Angeles and which has successfully withstood severe tests for a period of four years. The cost, he declared, has been little more than half the cost of methods previously employed.

A reasonable means of finding how much money should be spent on roads in a given district was outlined by J. E. Pennybacker, secretary of the Asphalt Association. He said that this should be determined by the tax on gasoline as one factor, and the number of vehicles traveling over a given road as another. From these two factors it could be readily computed, he said, how much the road is yielding to the state in revenue through the gasoline tax, and the road could be capitalized at so much a mile on that basis which would then give a tangible means of determining the amount it would be justifiable to spend on it. Exceptions to this must be made however, he pointed out, because some roads carrying only light traffic are required to be kept in good shape, and others are maintained for historic or sentimental reasons.

In the open forum on this question it was shown that the cost of transportation is two-fold, one aspect involving the roadway and the other the rolling stock, but both are paid for by the same persons. For this reason, he said, road builders should have as their ideal a type of construction that will give the least possible wear on cars and tires because this wear, together with gasoline consumption, is by far the largest item of cost in transportation expenses.

The floor discussion on the justifiable expenditures for road construction also brought out the statement that engineers have given most attention to heavy traffic problems and almost none to remote highways which are necessary feeders to the heavily traveled roads and are an important factor in expanding rural development. It has been suggested that an advisory committee be appointed to advise improvements and economies for secondary highways.

The effects of Alkali soils and waters on certain road materials was discussed by G. W. Craig, manager of the middle western branch of the Asphalt Association in Chicago. He was followed by Dr. S. H. Diggs, of Gasper, Wyo., chief research chemist of the Midwest Refining Company. Dr. Diggs explained that the damage to cement concrete from alkali is caused by the soda of the percolating salts replacing the lime of the cement, leaving nothing but loose dust where once there was cement.

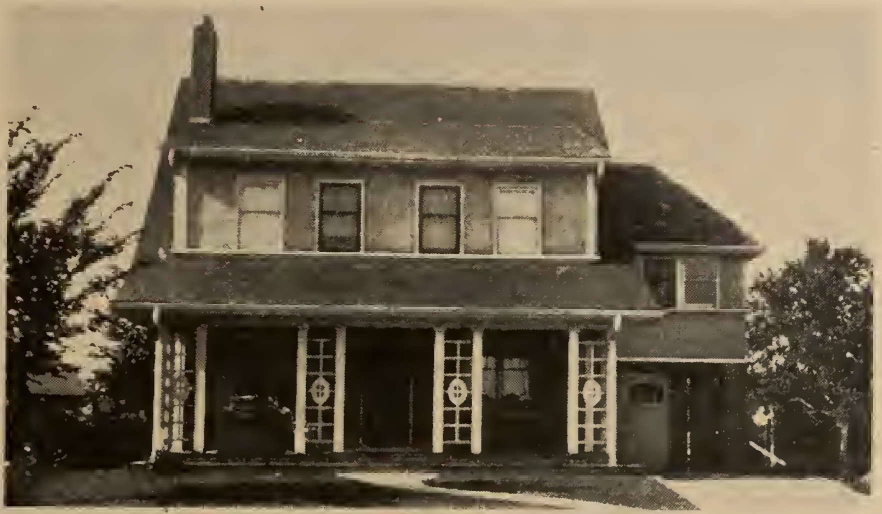
It has been definitely decided that the conference is to be an annual affair, so successful have the two past meetings been, according to Secretary Pennybacker. The place for the next meeting will be decided within the next few months.

A Three-Unit Heating Plan

Nice adjustment of the heating plant to varying weather conditions, with consequent saving in heating costs and gain in equality of temperature, is made possible in one large store building by dividing the heating plant into three separate units. Each unit is connected to some of the radiators on each of the floors. In the fall or spring only one or two of the heating units need be operated. In the winter, even in the coldest weather, the three units are capable of heating the building to a comfortable temperature.

Besides the saving in heating costs and the increase in nicety of temperature regulation, a further advantage of this arrangement is that in case of breakdown of any one unit, the heating plant is not totally disabled.—Bert A. Teeters, in "System."

The Contract Record's
Weekly House Suggestion No. 84

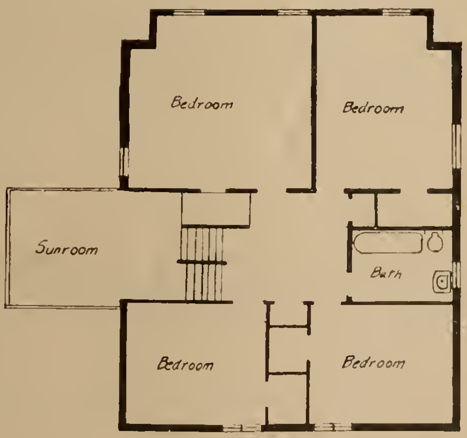


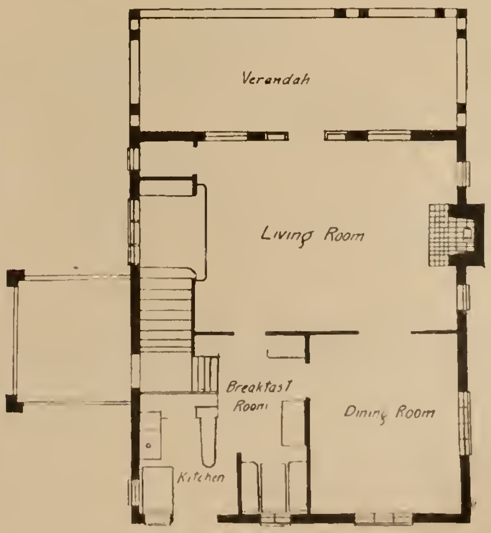
We are showing this week the handsome residence of Mr. Miller, Manager of the Ontario Sewer Pipe & Clay Industries, Ltd., at Mimico, Ont., built by Mr. J. McGonegal, 56 Jackman Ave., Toronto. The house is or red pressed brick construction on the first floor, with stucco on hollow tile above. The roomy verandah at the front is laid with a red quarry tile floor and handsomely trimmed with wood lattice work, painted white.

Entrance is direct on a large living room, the full width of the house, as seen in accompanying plan. The main staircase on the right is in ash, to match the balance of the trim and is one of the features of this room. A large brick mantel is located in the left side wall, as also indicated in plan. The kitchen, breakfast room and dining room arrangement is compact and convenient in this layout. A separate entrance on the side serves this section of the house. The floors are of oak throughout.

The upstairs layout combines four large bedrooms, sunroom and bathroom, with a minimum of hall space. The flooring is of oak, and the trim ash, as downstairs, with the exception of the bathroom, which has tile floors and walls to a height of 4 ft.

The basement is divided into laundry, fruit cellar and boiler room. Heat is supplied by a Spencer heater.





Thos. Adams Consultant on New York Plan

Mr. Thomas Adams, of the firm of Thomas Adams and Longstreth Thompson, town planning consultants, 121 Victoria Street, Westminster, Eng., has been appointed chief consultant to the committee on the plan of New York and its environs. The plan of the committee deals with an area of 5,220 square miles having a population of about 9,000,000. Other work which the firm has on this continent includes the completion of the plans of Kitchener, Ontario, and of the new town being built by Messrs. Sir. W. G. Armstrong, Whitworth & Co., in Newfoundland.

The acceptance of the New York work will not affect the English practice of the firm, as Mr. Adams will continue to devote all the time that will be needed, in conjunction with his partner, to carry out any schemes or surveys in England.

In addition to the New York work, the firm is engaged in preparing regional plans for the West Middlesex and Thames Valley regions of Greater London, affording opportunities for interesting comparative studies to be made of conditions in London and New York; also in preparing plans for other towns, including Hastings and St. Leonards, in collaboration with Messrs. T. H. Mawson & Sons.

Mr. Horace L. Seymour, M.E.I.C., of Toronto, is collaborating with Mr. Adams in the Kitchener scheme.

Mainly Constructional

East and West—From Coast to Coast

F. A. Meunier, contractor, of Montreal, has assigned to Mr. Wilfrid Damphousse.

The Hurst Engineering & Construction Company, of Winnipeg, have registered to operate in Saskatchewan.

A recent report quotes Hon. Geo. S. Henry, Ontario Minister of Highways, as stating that an entire new survey of the provincial road system will be undertaken this fall and completed before the opening of the 1924 construction season.

Rapid progress is being made on the new Basilica at Quebec, according to recent report. It is expected that the building will be entirely roofed in by November and the main and side towers completed next spring.

At the annual conference of the Ontario Association of Architects, held recently in Windsor, Mr. Stanley T. J. Fryer, of Hamilton, was elected president; Mr. Gilbert J. P. Jacques, of Windsor, vice-president, and Mr. D. W. F. Nichols, of Windsor, representative to the Royal Architectural Institute of Canada.

Caron Freres, of Montreal, were recently granted a permit to erect a factory building on Bleury St., at a cost of $750,000. The building will be a 10-storey structure, 136 x 207 ft.

A plant for the manufacture of asbestos products is being erected by the Canadian Johns-Manville Co. Ltd., at Asbestos, P. Q. At present two buildings are under construction, both 1-storey concrete and steel structures, 1,000 x 150 ft., and costing approximately $250,000. The products of this plant will include: asbestos roofing, shingles, packing, insulation paper, millboard, brake linings, etc.

Additional credits for public works were voted at a recent meeting of the city council at Montreal. The total was $865,000, of which amount $504,000 is for new pavements, $132,000 for sewers, $86,500 for sidewalks and $139,861 for improving Cremazie boulevard, Routhier and Berri streets.

Plans are being prepared by Sproatt and Rolph, architects, of Toronto, for the new building at the southeast corner of Yonge and Gerrard streets, Toronto. It is to be built by the Canada Life Insurance Co. and will be known as the Gerrard Building. It will be a three-storey structure, the ground floor of which will be composed of stores. The two upper floors will be occupied by the Olympic Bowling Club. The building may cost, in the neighborhood of $200,000.

The Canadian Dredging Company, of Midland, Ont., has been awarded the contract for building 2,000 feet of breakwater at the south end of Port Arthur harbor. First unit of this work will cost over $300,000.

Personal

Mr. Walter Stuart Pavey, architect of London, Ont., was successful in having his design chosen in the London city hall design competition. Second prize was awarded by the judges, Colonel Chadwick, of Toronto, and Mr. Fryer, of Hamilton, to Watt & Blackwell, and third prize to Mr. A. E. Nutter. Mr. Pavey will supervise the construction of the new building, which will be a 3-storey structure, with a small clock tower.

Col. D. H. McDougall has resigned his office as vice-president of the British Empire Steel Corporation at Sydney, N.S., to devote himself to private interests. Col. McDougall has been associated with the companies now forming the corporation for twenty years.

Controller John Cameron, of Ottawa, has resigned from the council to take over the position of city building inspector.

Mr. D. G. Munroe has joined the staff of the Secord Construction Company in Toronto. Mr. Munroe was formerly employed by the Board of Education at Windsor, supervising the erection of the new Wyandotte School addition.

Obituary

Mr. John E. Parr, 169 Fifty-fifth avenue west, Vancouver, well-known architect and pioneer of the city died recently. Although he had been in indifferent health for some time, his death was totally unexpected. Heart disease is said to have been the cause. He was born in England sixty-seven years ago and had resided in Vancouver for the past thirty years.

Mr. Albert E. Gibson, of Meaford, Ont., engineer of the local power house and superintendent of Meaford's water works system, died in that town recently in his fifty-ninth year. Mr. Gibson was born at Mitchell, Ont., but resided for the greater part of his life in Meaford.

Mr. William Forbes, one of Toronto's oldest building contractors, died at his home in that city a short time ago. Mr. Forbes was 84 years of age and was born in Toronto. He was the first life member of the Toronto Builders' Exchange.

Trade Incorporations

Continental Equipment Company, Ltd., with head office at Montreal, capital $25,000, to carry on a general contracting business.

Walter M. Graham, Ltd., with head office at Toronto, capital $40,000, to carry on the business of general contractors and to deal in mill and mining supplies.

Superior Floors Laying Co. was a recent registration at Montreal.

CONSTRUCTIONAL ACTIVITY

Period of Sept. 26 to October 2, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Barton Township, Ont.
Plans are being prepared by Mr. E. R. Gray, Room 1, Court House, Hamilton, for water service for the township.

Batiscan, Que.
Work will be started shortly by La Cie Aqueduct Batiscan, on pumping plant for water supply. Reservoir, pumps and motor will be supplied and installed by the Ontario Wind Engine & Pump Co. Ltd., 12 St. Antoine St., Montreal, and pipes, valves and fittings, etc., by Canadian Fairbanks-Morse Co. Ltd., 84 St Antoine St., Montreal. Engineer, R. Morrissette, Cap de la Madeleine, P. Q.

Caribou District, B. C.
The Provincial Government has passed appropriations for the construction of the following settlers' roads: Mud River, $3,000; Mildrum Creek, $2,000; Bonchie & Milburn Lakes, $5,000; Upper Horsefly Creek. $2,500; Peavine Ridge, $3,000 Woodpecker, $3,000; Quesnel River Ferry, $3,000. All work will be done by day labor under district engineer and foreman.

Hamilton, Ont.
The city council are purchasing property for the opening of Depew St. from its present limit to the Bay. Engineer, A. L. McFaul.

Ottawa, Ont.
The city is laying 5,500 yds. of asphalt pavement on Bethany Rd., from Irving to Parkdale Ave., at a cost of $27,000. Work is being done by day labor.

St. Hyacinthe-Melbourne Highway, P. Q.
Tenders are being received by the deputy minister of Highways, J. L. Boulanger, Parliament Buildings, Quebec, until October 20, for gravelling in the municipalities of Village St. Joseph, 2,177 ft.; Parish St. Hyacinthe Le Confesseur, 14,860 ft.; Parish St. Liboire, 31569 ft.; Village St. Liboire ,1,004 ft.; Parish St. Ephrem d'Upton, 7,384 ft.; Parish St. Andre d'Acton, 41,597 ft.; Town of Acton Vale, 2,239 ft.; Parish St. Christine, 20,762 ft. Plans and specifications with the department.

Three Rivers, Que.
Tenders are being received by the engineer, Chas. Gelinas, for bituminous macadam pavement on Royal, Hart, Champflenr, Champlain, Alexandre, St. Denis, St. Joseph, St. Oliver and St Paul Sts. Approximately 4 miles. No closing date set.

Toronto, Ont.
Tenders are being received by the city until October 9 for watermain on Old Orchard Grove, Rosewell, McNairn and Cranbrooke Avenues and Young Blvd.

Tenders are being received by the city of Toronto until October 9 for concrete sidewalks on Cloverlawn Ave., Firstbrook Rd., Latimer and Roselawn Aves.

The city of Toronto is receiving tenders until October 9 for the construction of sewers on Hillsdale, Eastbourne, Andersen, Maxwell, Berwick, Duplex and Colin Avenues, and Oriole Parkway and Lascelles Blvd.

Tenders are being received by the city of Toronto until October 9, for asphalt pavement on Adrian Ave.

Tenders are being received until October 9, by the city council for grading on Hiltz Ave.

York Township, Ont.
Township council, office address 40 Jarvis St., Toronto, have invited several engineering firms in this district to submit reports for a sewerage scheme from Avenue Rd, westward to the eastern limits of Mt. Dennis, and including York Township east of Black Creek.

CONTRACTS AWARDED

Fonthill, Ont.
Horton Steel Works Ltd., Bridgeburg, Ont., have been awarded contract for standpipe and foundation; Canadian Fairbanks-Morse Co. Ltd., 26 Front St. W., Toronto, the contract for pumps, in connection with the waterworks system for Fonthill. Engineers are James, Proctor &Redfern, Ltd., Excelsior Life Bldg., Toronto.

Niagara Falls, Ont.
The John E. Russell Co., Harbor Building, Toronto, have been awarded the contract for the supply of 3,000 ft. of No. 1 sanitary sewer pipe, 24 in. diameter, for the city of Niagara Falls.

Ottawa, Ont.
O'Leary's Ltd., Bank National Bldg., have been awarded the contract for 7,500 sq. yds. of asphalt pavement on Carling St., from Preston to Fairmont.

Point Grey, B. C.
The contract for concrete paving to cost $68,000 has been awarded to Ritchie Supply Co., 1318 Granville St., Vancouver, B. C. W. B. Greig is the engineer in charge.

Port Dalhousie, Ont.
Somerville & Dilworth, 22 Cross St., Welland, have the contract for the laying of two strips of concrete pavement, one from easterly boundary of Locke St. to westerly boundary of village, at $11,355, and the other on Locke St., from Front St. to Main St., at $2,550.

Three Rivers, P. Q.
The city council has awarded the contract for macadam road to Clifford & Bourassa, St. Antoine St., at $60,000.

The contract for approximately four miles of concrete pavement on Ste Julie, St. Maurice, St. Thomas, St. Louis, Volentaire, Notre Dame and Laviolette Sts., has been let to Donat Blanchette, 331 Laviolette St., at $57,175.

The city is building an aqueduct and sewer on Boulevard St. Louis, at a cost of $5,720, by day labor. Materials are supplied by Canada Iron Foundries Ltd., St. Maurice St.

Togo, Sask.
A. Loptson, Beadenbury, Sask., has the contract for roadwork from Togo north and south, 9 miles, at a cost of $16,700.

Vancouver, B. C.
The city of Vancouver has awarded the contract for concrete walks and curbs to Scott & Anderson, 306-20th Ave. E., Vancouver, at $20,608.

York Township, Ont.
The following sidewalk contracts have been let recently by the township council: $1,800— C. O. Matthews, 2142 Dufferin St., Toronto; $1,530—Fairbank Construction Co., c/o owner; $4,400—F. C. Shipp, 1609 Queen W., Toronto; $2,500—John Harrop, 1414 Davenport Rd., Toronto; $11,300—National Contracting Co., 9 Garnock Ave., Toronto; $3,000—D. MacKay, 289 Ashdale Ave., Toronto; $3,000—Murphy Contracting Co., 8 Wychwood Park, Toronto; $4,100—J. McAdam, 45 Jarvis St., Toronto.

Contracts have been let by the township council for watermains, as follows: town engineer, $5,600; Murphy Contracting Co., 8 Wychwood Park, Toronto. $1,000.

Railroads, Bridges and Wharves

St. Antoine de Tilly, Que.
Tenders are being received by R. C. Desrochers, secretary, Dominion Department of Public Works, until October 5 for repairs and addition to wharf on the St. Lawrence River, in Lotbiniere County. Plans and specifications with the Department, Ottawa; at offices of district engineers, Port Office Bldg., Three Rivers, P. Q.; Shaughnessy Bldg., Montreal; Post Office Bldg, Quebec, and at the post office at St. Antoine.

St. Barthelem, P. Q.
Tenders are being received until October 5, by R. C. Desrochers, secretary, Department of Public Works, Ottawa, for wharf and approach here. Plans and specifications are at the department, Ottawa; at the offices of the district engineers, Shaughnessy Bldg., Montreal: Post Office Bldg., Quebec; and at post office, St. Barthelem.

Windham Township, Ont.
The township council are contemplating the erection of a bridge on Conces-

sion 12. Clerk, H. McKnight, Windham Centre, via Simcoe.

CONTRACTS AWARDED

Kamloops, B. C.

Wm. Greenless, 592 Seymour St., Vancouver, has the contract for the substructure, and the Dominion Bridge Co., Montreal, contract for the superstructure of the proposed new bridge across the Thompson River here, for the Provincial Government. It will be a steel through truss bridge of 5 spans and shore approaches of 40 ft. at each end, with 6 concrete piers and pile foundation, and will cost $184,000.

Sandwich, Ont.

The town council has awarded Mr. Ernest Warner contract for the erection of the following bridges; Huron Line Bridge, $1,145.20; Felix Ave. Bridge, $888.30½; Wright Place Bridge, $601.55.

Terrace, B. C.

Contract for the steel superstructure of the proposed bridge over the Skeena River here to be built for the Provincial Government, has been awarded to J. Coughlan & Sons, Ltd., Columbia St., Vancouver, at $104,000 E. H. Shockley and O. Hanson, Prince Rupert, B. C., have contract for the sub-structure at $34,000. The bridge will be 970 ft. long, will be supported on 2 concrete and 2 piling piers, will have six spans, all of the "through steel" type.

Public Buildings, Churches and Schools

Almaville, Que.

Jules Caron, architect, 21 St. Joseph St., Three Rivers, is preparing plans for $60,000 church for the R. C. Congregation here. Structure will be 1 storey, 160 x 50 ft., of rubble construction and reinforced steel.

Dixie, Que.

C. R. Tetley, architect, 314 Beaver Hall Hill, Montreal, will call tenders in a week or so for a club house north of the C.P.R. tracks here for the Summerlea Golf Club, 326a Board of Trade Bldg., Montreal.

Guelph, Ont.

Bulk tenders are being received until October 5, by Stevens & Lee, 62 Charles St., E., Toronto for alterations and addition to hospital building here for St. Joseph's Hospital.

Hamilton, Ont.

Tenders are being received till October 11, by the architects, Witton & Walsh, 7 Hughston St. S., for the erection of a school. Plans and specifications with architects.

Tenders are being received by District Engineer of the Dominion Government Department of National Defence, Military District No. 2, 185 Spadina Ave., Toronto, until October 10, for a new roof covering for the old and new armouries. Plans and specifications are at the above office and also at the office of the officer in charge, Hamilton Armouries.

Islington, Ont.

Plans are being prepared by Craig & Madill, 707 Yonge St., Toronto for a club house at Islington, Ont. Work will be gone ahead with in the spring.

Kingston, Ont.

Tenders are being received by R. C. Desrochers, secretary, Dominion Department of Public Works, Ottawa, until October 16, for an addition to the dormitory building of the Royal Military College, Kingston. Plans and specifications may be seen at the offices of the chief architect of the department at Ottawa; offices of the resident architect, Dep't. of Public Works, Merchants Bank Bldg., Kingston, and with the assistant mechanical engineer, Dom. Pub. Works Bldg., Place Royale, Montreal.

Liverpool, N. S.

Tenders are being received until October 9, by R. C. Desrochers, secretary, Dom. Department of Public Works, Ottawa, for electric wiring and fixtures for public building here. Plans and specifications with chief architect, Dep't. Pub. Works, Ottawa; Clerk of Works, Dom. Pub. Bldgs., Halifax, and the caretaker,, Pub. Bldgs., Liverpool, N. S.

London, Ont.

Plans will be prepared by A. M. Piper, Building Inspector, City Hall, London, for remodelling the interior of the crystal palace at the Western Fair grounds.

Montreal, P. Q.

Royal Victoria Hospital here is contemplating the erection of a maternity hospital. The architects are Stevens & Lee, 62 Charles St. E., Toronto.

Newmarket, Ont.

Tenders are being received by the general contractor, W. E. Richardson, for felt and gravel roofing, lathing and plastering in connection with $55,000 addition for the local School Board.

Pointe-Aux-Trembles, P. Q.

The Brothers of the Sacred Heart, 684 Fullum St., Montreal, are contemplating the erection of an addition to cost $200,000 to school here.

Rockport, Ont.

Plans are being prepared for a new school at Rockport, Ont. Sec.-Treas. of the board, Dewitt Williams.

Sackville, N. B.

The Dominion Government Department of Public Works are calling tenders through the secretary, R. C. Desrochers, until October 15, for public building here. Plans and specifications are at the office of the chief architect, Department of Public Works, Ottawa; at the office of the resident architect, Department of Public Works, St. John, N. B., and with the caretaker, Public Bldg., Sackville, N. B.

Sault Ste. Marie, Ont.

V. K. Gibson, 624 South Michigan Ave., Chicago, Ill., has been appointed architect for the proposed $300,000 hotel which Dominion Hotels, Ltd., 66 King St., Hamilton, propose erecting here.

Selkirk, Man.

Tenders will be received till October 8 by W. R. Club, Minister of Publc Works Winnipeg, Man., for steam piping and auxiliary machinery to be installed in the new power house being constructed for the Hospital for Mental Diseases. Plans and specifications at Room 27, Parliament Bldgs., Winnipeg, Man. Contracts Awarded

Toronto, Ont.

Plans are being prepared by Darling & Pearson, 2 Leader Lane, for a 1-storey addition to the Out Patients Building of the Toronto General Hospital, on College St. Tenders will be called early next month.

St. Andrews College has purchased a site for $400,000 school at Aurora, Ont. Sproatt & Rolph, 1162 Bay St., are preparing plans for the new building.

Tenders are being received till October 13, by the Dep't. of Public Works, through the secretary, H. F. McNaughton, Parliament Bldgs., Toronto, for electric wiring in connection with $150,000 court house being built. Plans and specifications with Dep't. Toronto and office of the general clerk of public works department, Haileybury. Dickie Construction Co., Ltd., Toronto, are the general contractors.

CONTRACTS AWARDED

Asbestos, Que.

The contract for a $250,000 church for the R. C. Parish has been awarded to Poudrier & Boulet, Black Lake, Que. Architect—L. N. Audet, 32 Wellington St. N., Sherbrooke, Que. No materials purchased.

Beatty, Sask.

A. W. Heise & Co., Saskatoon, Sask., have the general contract for the erection of an $8,000 school.

Guelph, Ont.

The following contracts have been let in connection with the new memorial hall being built by the provincial department of public works here: roofing and sheet metal, slating and galvanized iron, J. E. Riddell and Sons, 2 Ferguson Ave. N., Hamilton; steel, Hamilton Bridge Works Co. Ltd., Bay St. N., Hamilton; plastering, Hall Bros., 53 Rosslyn Ave. N., Hamilton; tiling, Italian Mosaic & Tile Co. Ltd., 429 Spadina Ave., Toronto; cut stone, Ritchie Cut Stone Co. Ltd., 191 Grant Ave., Hamilton; painting, F. G. Roberts & Co., 106 Wells St., Toronto.

Mabou, C.B.

The millwork contract in connection with $115,000 county asylum at Mabou has been let to B. W. Lockhart, Ltd., 95 Westmoreland Ave., Moncton, N. B. General Contractor, Parsons-Ed Co. Ltd., Lester Ave., Moncton, N. B. Architect, J. W. McKay, Pictou, N. S. The electric, plumbing and heating trades will be let.

Moncton, N. B.

Ambrose Wheeler, Ralph St., has been awarded the general contract for $15,000 masonic temple for the Moncton Masonic Temple, Ltd. The structure will be located on Queen and Alma Streets. Architect, J. W. Fraser, 132 Stedman St.

Ottawa, Ont.

The Carswell Construction Co. Ltd., 58 Wellington St. E., Toronto, have been awarded the general contract for the construction of $100,000 bank building for the Bank of Nova Scotia here. Architect, John M. Lyle, 230 Bloor St. W., Toronto.

Quebec, Que.

Excavating work is being done for a $20,000 institute on St. Andrews St. for Leauren's Institute. Architect—Thos. R.

Peacock, 81 St. Peter St.; general contractor—Chrys. Jobin, 182 Latourelle St.

Regina, Sask.
Messrs. Wilson & Wilson, Ltd., 1363 Albert St., Regina have been awarded the contract for foundations of school for the Regina Hebrew Free School, at $6,700. The school will be a 2-storey structure, 50 x 70 ft., of brick and hollow tile construction. Storey & Van Egmond, Regina, Sask., are the architects.

Sarnia, Ont.
Sarnia Curling Club Ltd., 308 N. Vidal St., have awarded the contract for new curling rink on North Front St., to Thos. Grace, S. Christina St. The Sarnia Bridge Co., Campbell St., will supply the structural steel, and Laidlaw Belton Lumber Co., Devine St., the millwork. The architect is Chester Woods, N. Christina St.

Tecumseh, Ont.
Tecumseh Separate School Bd. have awarded the contract for electrical work in connection with 6-room addition to their school here to F. D. Reaume, Wyandotte St. E., at $538.28. The building will cost $40,000. Gilbert J. P. Jacques is the architect.

Thorold, Ont.
Newman Bros., 75 St. Paul St., St. Catharines, Ont., have been awarded the contract for the erection of a school building for the local school board, on Queen St., at a cost of $82,000. The architects are Nicholson & MacBeth, 46 Queen St., St. Catharines.

Three Rivers, P. Q.
R. Gonneville, 17 St. Denis St., has the plastering contract, and P. Rochon, 21 Badeaux St. the electrical contract in connection with $25,000 school for the R. C. School Commission. General contractors are A. Dube & Cie. Bellefeuille St.

C. E. Hamelin, 90 Prosper St., has the plumbing contract in connection with $75,000 kiln and heating system at the Hospital St. Joseph. General contractors are Beaudry & Trepannier, 34 Badeaux St.

Toronto, Ont.
The following contracts have been let in connection with the $125,000 program of remodelling at the headquarters of the Y.W.C.A., 21 McGill St.; masonry, Carter & Cecil, 269 Leslie St.; steel, Disher Steel Construction Co., foot of Cherry St.

J. T. Bowes, 1276 Danforth Ave., has been awarded the plumbing contract in connection with $100,000 addition to the Danforth Ave. Methodist Church, at 310 Danforth Ave. The plastering, roofing and electric trades are not let yet.

Woodstock, Ont.
A. E. Noble, William St., London, was awarded the contract for cut stone, and Canadian Wire & Iron Goods Co., 180 King William St. Hamilton, the contract for steel staircase for the $100,000 addition to Central School. J. H. Grenfell, 421 Dundas St., is the architect.

Business Buildings and Industrial Plants

Brampton, Ont.
Gummed Papers Co., Henderson St., are contemplating a $12,500 addition to their factory. New machinery to the value of approximately $5,000 would be required.

Cochrane, Ont.
Tenders are being received by the owners, M. Karan & Co., no closing date set, for the erection of a $20,000 store. Plans and specifications with owners. Architect—W. H. Bishop.

Gowganda, Ont.
Castle Trethewey Mines Ltd., Standard Bldg., Jordan & King Sts., Toronto, propose the erection of a 100-ton mill at Gowganda, under the direction of the consulting engineer, F. J. Ennis, Porcupine Mines, Schumacher, Ont.

Lambeth, Ont.
Foundations are in for a $9,000 store being built for Mahon & Hayball here. General contractor is Mr. W. Woodhull.

Lethbridge, Alta.
Whiddington & Fry, architects, Lethbridge, Alta., are preparing plans for a masonic hall for the Chinese Masonic Hall Co. Tenders will be called soon.

London, Ont.
S. F. Glass, 291 Central Ave., will prepare plans for the remodelling of old building at 61 Dundas St. into stores, at an estimated cost of $10,000.

Midland, Ont.
The International Fibre Board Co., Ltd., Canada Cement Bldg., Montreal, are contemplating the location of a factory building here.

Montreal, P. Q.
Daniel Vezeau, 231 Manufacturers St., contemplate the erection of a public garage at 211-213 Manufacturers St.

A local Syndicate have purchased a 14,000 sq. ft. site at the corner of St. Alexander and Major Sts., plans prepared for a textile manufacturing building. The interested parties are, Messrs. R. H. Blumenthal, 223 Craig St. W., Samuel Weiner, Samuel Hart and Mr. Nevinson.

Point Grey, B. C.
Work is to start at once for a $10,000 sawmill for the McNair Lumber & Shingle Co., North Vanvouver.

St. Lambert, P. Q.
Tenders will be called shortly by St Lambert Dairy, Riverside Drive for a dairy building on St. Denis St. Building will be 1½ storeys, 30 x 50 ft.

Toronto, Ont.
Work is to start shortly on steel arch bridge (Vale of Avoca). General contractors—Russell Construction Co.; steel —Canadian Bridge Co., Ltd., Walkerville, Ont.

Tenders are in for the 2-storey and basement structure which the Canadian Bank of Commerce propose erecting on the southwest corner of Yonge St. & St. Clair Ave. The building will be 87 x 100 sq. ft., of brick construction.

Tenders are being received by K. Hyslop, architect, 10 Sparkhall Ave., and V. Daniels, 985 Dundas W., contractor, for sub-trades and materials required in the erection of $60,000 bowling alley and stores to be erected for T. J. Ford, 303 Church St. The building will be 2 storeys, 75 x 130, of reinforced concrete, steel and brick construction.

J. Crosbie, 2 Eglinton Ave. W., contemplates the erection of 2 stores and apartments.

Willowdale, Ont.
The township clerk, H. C. Goode, Lansing, Ont., wants prices at once on electrical fixtures and lineleum, furniture, desks, etc., for $20,000 office building being built by North York Township at the corner of Express Blvd. and Yonge St.

Windsor, Ont.
Tenders will be called shortly by the Bank of Montreal, Montreal, P. Q., for an addition to the branch at Ouellette & Chatham Sts., Windsor. It will be 1-storey, 28 x 62 ft. Kenneth G. Rea, 285 Beaver Hall Hill, Montreal, is the architect.

Winnipeg, Man.
The foundations are in for a $79,929 addition to bakery of Spiers-Parnell Baking Co. Ltd.; architects—Jordon & Over, 47 C.P.R. Bldg., Winnipeg; general contractors—Carter, Halls, Aldinger Co., Ltd.; plumbing and heating—C. D. Kirk Co.; cut stone—Western Stne Ltd.; millwork—Radford Wright Co. Ltd.; roofing and sheet metal—Canadian Rogers Sheet Metal & Roofing Co., Ltd.; plastering—Western Plastering Co.; marble and tile—Winnipeg Marble Co. Ltd.; painting and glazing—Whitecross Painting Co., Ltd.; reinforced steel—C. A. P.Turner; structural steel—Dominion Bridge Co., Ltd.; electrical not yet let.

The walls are going up for a $21,000 addition to office building owned by the Can. Westinghouse Co., Ltd. Architect, J. H. G. Russell, 1110 McArthur Bldg., Winnipeg. General Contractors—Carter-Halls-Aldinger Co.; plumbing and heating—Bowyer-Boag, Ltd., Winnipeg, $2,400, cut stone—Western Stone Ltd.; millwork—Brown & Rutherford, Sutherland & Buchannan; roofing and sheet metal—Western Steel Products Ltd.; electric—Star Electrical Co.; plastering—Western Plastering Co.; painting and glazing—Whitecross Painting Co., Ltd.; reinforced steel—C. A. P. Turner; structural steel—Vulcan Iron Works, Ltd., Pt. Douglas, Mar

CONTRACTS AWARDED

Ailsa Craig, Ont.
The carpentry contract in connection with Oddfellows Hall and stores on Main St., for the Ailsa Craig Oddfellows, has been awarded to H. Gibson & Son, Lucan. General contractor is J. A. McDonald, and architect, H. C. McBride, Molsons Bank Bldg.

Brockville, Ont.
W. E. Brown has been awarded the general contract for the erection of 3 stores and apartments on the north side of King St. W., by E. Cancilla, 170 King St. W. Edward Watson the masonry contract; John Semple, 110 King St. W., the plumbing contract.

Ford, Ont.
The following contracts have been let in connection with power house and screen house being erected for the Ford Motor Company of Canada here, by the S. E. Dinsmore Co. Ltd., McGregor Bldg., Windsor: tile terrazzo and marble —Italian Mosaic & Tile Co. Ltd., 442 King W., Toronto; reinforcing and steel sash — Trussed Concrete Steel Co.,

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

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TENDERS

TOWNSHIP OF TECK

The Corporation of the Township of Teck are asking for Tenders on the Installation of an Electric Lighting Plant for the Townsite of Swastika. Tenders close

October 6th, 1923,

The lowest or any tender not necessarily accepted.

Particulars may be had by addressing

MALCOLM CAMPBELL,
Kirkland Lake, Ont.

39-40

TOWNSHIP OF ETOBICOKE

Waterworks Extensions

Sealed tenders plainly marked as to contents will be received up to 12 o'clock noon of

Monday, October 8th, 1923,

for the laying of approximately 3,510 feet of 6-inch and 4-inch water mains.

Plans and specifications may be seen and forms of tender obtained at the Township Offices, Islington.

The lowest or any tender need not necessarily be accepted.

N. MacNICOL,
Township Engineer,
Islington, Ont.

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CITY OF BRANTFORD

Auction Sale of Iron and Steel from Two Bridge Spans

A Public Auction for the sale of the iron and steel from two bridge spans will be held at the Corporation Yard, West Brantford, on

Wednesday, October 10th, 1923,

at 3 o'clock P.M.

This material will be sold subject to a reserve bid.

Particulars and Terms and Conditions of Sale may be obtained from the office of the City Engineer, City Hall, Brantford, Ontario.

F. P. ADAMS,
City Engineer.

C. S. MOYER,
Chairman of the Board of Works.

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RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Town of Port Hope

Tenders for Sewer Pipe

Tenders will be received by the undersigned up to 5 P.M.,

Monday, October 8th, 1923,

for the supplying and laying approximately 4,000 feet 8-10-12 inch Sewer Pipe.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

J. W. SANDERS,
Town Clerk.

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DEPARTMENT OF ROADS

TENDERS

Saint Hyacinthe-Melbourne Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tenders", followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until one o'clock of the afternoon, on

Saturday the twentieth (20) of October, 1923,

for the construction in gravelling of Saint-Hyacinthe-Melbourne Highway in the Municipalities of the Village of St-Joseph, length 2,177 feet, the parish of Saint-Hyacinthe-le-Confesseur, length 14,860 ft.; the parish of Saint-Liboire length 31,569 ft., the village of Saint-Liboire, length 1,004 feet, the parish of Saint-Ephrem-d'Upton, length 7,384 feet, the parish of Saint-Andre-d'Acton, length 41,597 feet, the town of Acton-Vale, length 2,239 feet and the parish of Sainte-Christine, length 20,762 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.

Quebec, September 27th, 1923.

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TO HEATING, PLUMBING AND ELECTRIC CONTRACTORS

Sealed tenders marked "Tenders Plumbing and Electric Wiring," addressed to the undersigned, will be received at this Department until

Saturday, October 13th 1923,

for the Heating, Plumbing and Electric Wiring for Court House, Port Arthur, and for Electric Wiring, Court House, Haileybury.

Plans and specifications for Court House, Port Arthur, can be seen at the office of The Howe Engineering Co., Port Arthur, and for Court House, Haileybury, at the office of the General Clerk of Works, Public Works Department, Haileybury, and at this Department.

Each tender must be accompanied by an accepted bank cheque payable to the Honorable George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent of the tender, and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company, approved by the Department, willing to provide a bond for the due fulfilment of the contract.

The Department is not bound to accept the lowest or any tender.

By Order,
H. F. McNAUGHTEN,
Secretary, Public Works Department, Ontario.
Toronto, Sept. 28th, 1923.

Newspapers publishing this without authority, will not be paid for it.

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Sealed tenders addressed to the undersigned, and endorsed, "Tender for addition to Dormitory, R. M. C. Kingston, Ont.," will be received until 12 o'clock noon,

Tuesday, October 16, 1923,

for the construction of an addition to Northern end of present Dormitory Bldg., Royal Military College, Kingston, Ont.

Plans and specifications can be seen and forms of tender obtained at the offices of the chief Architect, Department of Public Works, Ottawa, the Resident Architect, General Post Office, Toronto; Resident Architect, Department of Public Works, Merchants Bank Building, Kingston, Ont., and the Asst. Mechanical Engineer, Dominion Public Works Bldg., Place Royale, Montreal, P.Q.

Blue prints can be obtained at the office of the Chief Architect, Department of Public Works, by depositing an accepted bank cheque for the sum of $50.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 24, 1923.

39-40

TENDERS WANTED

Board of Education

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, October 9th, 1923,

for

Hardware, Painting and Glazing, Conservatory Enclosure for JARVIS COLLEGIATE.

Specifications and conditions for tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

F. E. POWELL,
Chairman, Property Committee.
W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
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Sealed tenders addressed to the undersigned, and endorsed "Tender for harbour improvements at Port Stanley, Ont.," will be received at this office until 12 o'clock noon,

Monday, October 22, 1923,

for harbour improvements, consisting of the construction of an east pier and a sheet pile wall, at Port Stanley, Elgin County, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Royal Bank Building, London, Ont.; Equity Building, Toronto, Ont., and at the Post Office, Port Stanley, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 29, 1923. 40-41

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6′ 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3,000 pair Blankets.
Cookery Outfit.

Apply to Box 375, Contract Record Toronto.
37-42

Machinery for Sale

20-ton Standard Gauge Industrial Locomotive Crane, mounted on 8 wheel M. C. B. Steel Car, enclosed steel cab, 50 ft. steel boom with 20 ft. extension.

2—1-yard clamshell buckets, newly rigged. Boiler, etc., in A1 condition. Box 390, Contract Record, Toronto. 40-43

For Sale New 2x4 Spruce For Flooring

Subject to Prior Sale

Approximately 200,000 feet of new 2 x 4 Spruce Lumber. Dressed four sides, chamfered two edged. Suitable for factory floor. We are open to receive offers for the whole or part. The Goodyear Tire & Rubber Co. Ltd., By-product Department. New Toronto, Ont. 38-41

Drum Hoisting Engine Wanted

Wanted to purchase 7 x 12, 2 Drum Hoisting Engine. Must be in good working order. Apply Hay & Company, Limited, Woodstock, Ont. 40

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28-t.f. **Niagara Falls**

Position Vacant: Engineer and Contractor's Superintendent, experienced in concrete construction, water and sewerage systems and general building. One speaking French preferred. Apply, stating experience and salary expected, to Box 388, Contract Record, Toronto. 40

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-42

Business Buildings and Industrial Plants

(Continued from page 53)

Walker Rd., Walkerville; cut stone—Central Canada Stone Co. Ltd., Point Edward, Ont.; miscellaneous and ornamental iron—Architectural Bronze & Iron Works, Lansdowne Ave., Toronto; metal—A. W. Carmichael Ltd., 918 Palmerston Ave., Toronto.

London, Ont.

R. G. Wilson & Son, 398 Ridout St., have been awarded the general contract for the erection of $20,000 office building at York and Ridout Sts., for the Hobbs Mfg. Co., 304 Ridout St.

Montreal, P. Q.

The millwork contract has been awarded in connection with $125,000 office building being erected at Victoria Pier for the Harbour Commission to Benoit & Mathieu, 198 St. Timothee. General contractors are Collet & Freres, 243 St. Hubert St. Architect, T. Daoust, 61 St. James St. The masonry, reinforcing steel, roofing, plastering and elevator contracs have yet to be awarded.

The following contracts have been awarded in connection with varnish factory for Thorp Bambrock Co. Ltd., 211 McGill St., which is being erected on Baby St.: structural steel, Dominion Bridge Co. Ltd., Domion Station, Lachine, P. Q.; roofing, Metal Shingle & Siding Co., 91 Delorimier St.; painting and glazing, Fryer & Matheson, 1431 St. Dominique St. Architects, Ross & McDonald, 1 Belmont St. General contractors, Fussing & Jorgensen, 6 Durocher St.

Moncton, N. B.

Ambrose Wheeler, Ralph St., has been awarded the general contract for a factory building to cost $12,000 for Morrow Manufacturing Co., c/o Geo. A. Robertson, Duke St.

St. Catharines, Ont.

Frid Construction Co., Clyde Block, Hamilton, have been awarded the general contract for the erection of the 3-storey terminal building at the corner of Geneva St. & Welland Ave., for the Toronto, Niagara & St. Catharines Railway, at $130,000. The building will be 40 x 131 ft.

Sault Ste. Marie, Ont.

McLarty Bros., 38 Wellington St., have been awarded the general contract and Ed. Keyes, Queen St. E., the contract for steel, in connection with $10,000 store block to be built on Queen St., for Mr. Harry Yates, Korah Township.

Timmins, Ont.

The roofing, sheet metal, plumbing and heating contracts in connection with $35,000 office building for Hollinger Gold Mines here, have been let to Le Cuyer & Smith, Timmins, Ont.

Residences

Ford, Ont.

Joe L. Reaume is erecting a $15,000 residence on Sandwich St. and has let the masonry contract to Manning & Parker, Jannette Ave. The carpentry work is being done by day labor. Electric, heating, plumbing, plastering and painting trades will be let. Irwin Walker, Manning Bldg., Windsor, is the architect.

Hamilton, Ont.

W. H. Northcott, 12 South St., is building an $8,000 residence at Mt. Royal, Orchard Hill, Hamilton.

Lachine, P. Q.

L. S. Bournet, architect, 260 St. Joseph St., has prepared plans for four residences to be erected on Notre Dame St., for O. Tessier, 432 St. Joseph St. Tenders will be called shortly.

Leaside, Ont.

Tenders are being received by Miss L. Dunn, 26 St. Clair Ave. East, Toronto for carpentry and masonry trades in connection with 4-suite apartment house she is building at Leaside.

London Ont.

L. G. Bridgeman, architect, Bank of Commerce Bldg., is preparing plans for a $10,000 residence to be erected on Grosvenor St.

Oakville, Ont.

R. W. Catto, 47 King St. W., Toronto, is preparing plans for a country residence on the Hamilton Highway near Oakville, Ont.

Ottawa, Ont.

Capital Contractors Ltd., c/o Denison, Jackson Bldg., are contemplating the erection of a $7,000 residence on Central Terrace. Site has been purchased.

Fryer & Pout, Euclid Ave., have purchased site for a $7,000 residence on Central Terrace.

Cowie & Moore, 414 Sunnyside, Ottawa, are building five residences on Renfrew Ave., to cost $5,000 each. Tenders are being received until October 11 for the plastering, painting, electric, plumbing and heating trades.

A site has been purchased on Central Terrace by T. E. Walker, 3 Renfrew Ave., who is contemplating the erection of a $7,000 residence.

Point Grey, B. C.

F. C. Shantz, 403 Pender St. West, Vancouver, is the general contractor for a $14,000 residence being built on 35th Ave. for W. G. MacKenzie, 843 Dunsmuir St., Vancouver. Architects—McCarter & Nairne, 709 Northwest Bldg., Vancouver.

Sandwich, Ont.

N. Herridge, 1544 York St., Windsor, is building a $9,000 residence on Russell St.

Ernest Renaud, 1413 Union St., Windsor, is building an $8,500 residence on Huron Line, and will let the plastering, plumbing and electric trades.

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FIDELITY AGENCY
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Three Rivers Que.

Jos. Lacroix, 10a Olivier St., is the general contractor for 3 cottages at $6,000 each, on Parc St. Jean Baptiste. Architects—Asselin & Denoncourt, 42 Alexandre St.

Toronto, Ont.

Select Homes Corporation, 11 Farnham Ave., have purchased sites on Rose Park, Heath St. E., Spring St. and Welland Ave. and propose carrying out a housing development. Architect for the corporation is Mr. Gibson, 300 Rose Park Drive.

The painting, plastering, electric, heating and plumbing trades will be let in connection with a residence under construction on Park Rd., costing $7,500, by A. Pretty, 17 O'Hara Ave., owner and builder.

The plastering, painting, electric, heating and plumbing trades will be let in connection with $8,500 residence being built on Ardagh Ave., near Windermere Ave., by Coulter & Mahoney, 578 Runnymede Road.

Tenders are being received by Jno. Baker, 362 Dundas St. E., for plastering, painting, heating and electrical trades in connection with $8,000 residence he is building on Edgewood Ave.

The painting, plastering, electric, heating and plumbing trades will be let in connection with $7,500 residence being built on Brummell Ave., by A. Dormer, 75 Brookside Ave.

Grimshaw Bros., 2033 Yonge St., contemplate the erection of two $10,000 residences in Lawrence Park, Toronto.

Tenders are being received by Urban Improvements, Ltd., c/o Craig & Madill, 707 Yonge St., on the plastering, painting, heating, plumbing and electric contracts in connection with a 2-family residence they are building at the corner of Carey Rd. and Cuthbert Cres.

Walter Pate, 3 Norval Ave., is building a $7,000 bungalow on Runnymede Rd., near Henrietta Ave., and will let the electric, plumbing and heating contracts.

The plastering, painting, heating, plumbing and electric trades will be let in connection with a $6,500 residence being built at 68 Rogers Rd., by F. Jay, the general contractor, 129 Nairn Ave.

Foundations are going in for a $7,000 residence at 296 Inglewood Drive, for Alf. Weir, 93 McPherson Ave. Contractor is Noble Graham, 93 Gothic Ave.

F. J. Clark, 53 Carus Ave., wants tenders on the painting, plastering, electric, heating and plumbing trades in connection with $8,000 residence he is building on Strathearn Ave.

A. E. Bannister, 50 Keystone Ave., is the owner and builder of 2 pair residences, $7,000 each, on west side Coxwell below Danforth Ave. Masonry day labor. Plumbing, plastering, painting, electric and heating to be let.

F. C. Lankin, 223 Fulton Ave., is the owner and builder of 4 pair residences, $7,000 each, on west side Coxwell below Danforth Ave. Plastering, painting, electric, heating and plumbing to be let. Contracts Awarded

J. B. Barclay, 27 Ward St., is building a $7,500 residence on Windermere Ave. and will let the painting, plastering, electric, heating and plumbing trades.

Tenders are being received by Grimshaw Bros., 2033 Yonge St., on the carpentry work (labor only) and also on various sub-trades in connection with the erection of a duplex residence at 742 Coxwell Ave.

J. Henderson, 666 St. Clair Ave. W., is building a garage on Humewood Court, near Humewood Ave., which will accommodate 13 cars.

A. H. Forster, 69 Glendale Ave., is receiving tenders for plastering, electric, plumbing and heating trades in connection with $10,000 duplex residence he is building on the south side of Patterson & Glendale Aves.

Jno. Carroll, 293 Kennedy Ave., will start work shortly on 2 bungalows in the Willard-Runnymede district.

Waterloo, Ont.

Jas. Valentine, Charles St., is calling for tenders until Nov. 2 for the erection of a residence here, estimated to cost about $7,000.

Windsor, Ont.

The plastering, plumbing and electrical trades will be let in connection with $8,000 duplex residence being built by B. Winch, 433 Church St., at lot 557 Bruce Ave.

CONTRACTS AWARDED

Brockville, Ont.

D. M. Ross, Pearl St. E., has been awarded the contract for the erection of a $7,300 residence on First Ave., for the Fulford Estate. The electric contract has been let to A. G. Doblin and the plumbing and heating contract to Geo. Ross.

Charlottetown, P. E. I.

The following sub-trades have been let in connection with the erection of $15,000 residence for Mr. Aubrey Brown, on Dorchester St.: electrical, M. Brown; plumbing and heating, Jas. McEachren; painting, Waller & Doyle; plastering, J.

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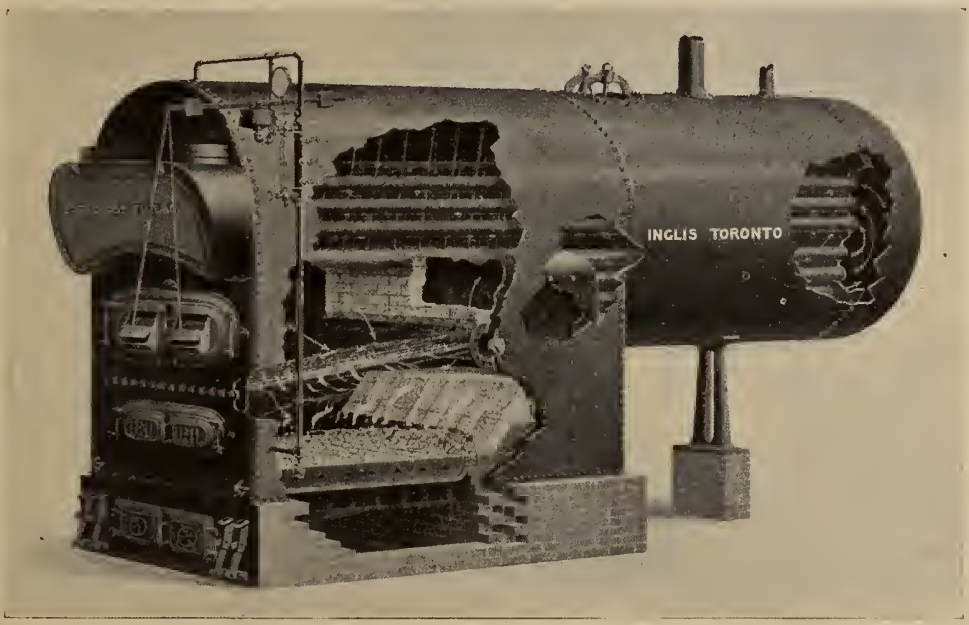

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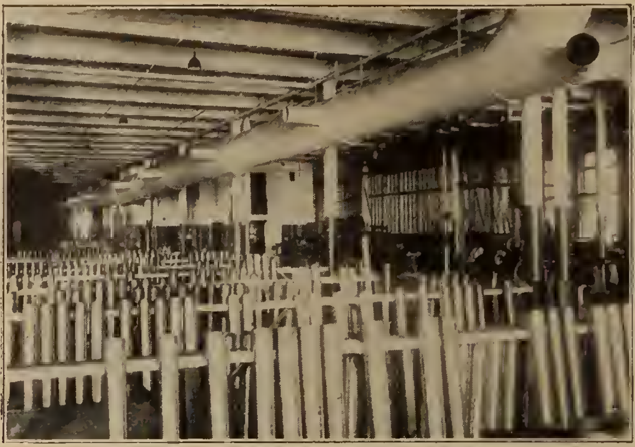

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When you come to the consideration of the most suitable Heating and Ventilation for your building, just remember that Sturtevant Engineers of long training and successful experience are ever ready to consult with you.

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PUTS AIR TO WORK

Montreal Winnipeg Galt Toronto

Ward, Sydney St. The general contractor is McDougall & McCauley, Kent St.

Kitchener, Ont.

The following sub-trades have been let by the architect, J. A. Thatcher, 27 Cowan Ave., Toronto, in connection with $25,000 residence being built by W. T. Saff, 12 Wilmot St.: carpentry, S. Dippel, 36 Pequegnat Ave.; masonry, Bierwagen & Sons, 213 Waterloo St.; plumbing and heating, William Snell & Co., 43 King St. W.; electric, Wattell & Bierwagen, 213 King St. W.

London, Ont.

The plumbing and heating contract in connection with $10,000 residence being erected by Jones & Spry, 381 Glebe St., on Brick St. for Geo. Nelson, 637 Dundas St., has been awarded to Wright & Teale Co., Dundas St.

Montreal, P. Q.

J. Becker, 1439 St. Dominique St., has been awarded the contract for plumbing and heating in connection with $15,000 residence being erected on Mance St., by J. Gilletz & Co., 1188 City Hall. Roofing, electric, painting and glazing contracts will be let.

Mr. Roy, 3680 St. Hubert St., has been awarded the contract for electrical work in connection with $12,000 residence being erected on Chateaubriand St., by J. R. Caisse, 3680 St. Hubert St.

St. Lambert, P. Q.

Mr. Fournier, 638 Notre Dame Ave., has the plastering contract, and C. E. McGregor, 55 Mercille Ave., the electrical contract, in connection with $8,800 residence being built on Pine St., by Modern Housing Co., 631 Notre Dame Ave., Montreal South.

Saskatoon, Sask.

W. J. Black, 118 27th St. W., has the contract for the erection of a $7,000 residence on Spadina Cres., for J. Isherwood, 1—31st St. The electric, plumbing and heating trades will be let.

Three Rivers, Ltd.

Jos. Lacroix, 10a St. Olivier St., has been awarded the general contract for residence on Coteau St. Louis for Maxime Gauthier, Ste. Cecile St.

Toronto, Ont.

J. E. McMillan, 164 Main St., has let the following sub-trades in connection with 6 pair of residences he is building on Pickering Ave.: electric, Taylor Bros., 25½ Norwood Ave.; plumbing, Chas. Legg, 120 Barrington Ave.; heating, Toronto Furnace Co., 35 Golden Ave.; plastering, F. Baker, c/o owner. Painting is being done by day labor.

Noble Graham, 93 Gothic Ave., has the general contract for the erection of $7,000 residence at 296 Inglewood Dr., for Alfred Weir, 93 McPherson Ave.

The electrical contract in connection with a pair of residences, costing $8,000 on 8th Ave., being built by F. Tunnard, 114 Lawlor Ave., has been awarded to Chas. H. Haines, 27 Currie Ave.

The following sub-trades have been let in connection with the erection of 6 pair and 1 single residence on 8th Ave., by F. Tunnard, 114 Lawlor Ave.: electric, Chas. H. Haines, 27 Currie Ave.; plumbing, L. Hollows, 2704 Danforth Ave.; heating, Toronto Furnace Co., 35 Golden Ave.; plastering, J. Thompson, 45 Gledhill Rd. Painting is being done by day labor.

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Toughness

A material which possesses toughness is defined by Webster as one possessing flexibility without brittleness; capability of resisting great strain or severe abuse; strength. The enormous strain which railroad rails receive in track service is ample proof that they possess toughness to a very high degree. They withstand, unprotected, the pounding of heavy equipment, whereas the reinforcing bars rolled from these rails are imbedded in concrete and although constantly stressed they are not directly subjected to shock and impact. The logical conclusion, therefore, is that rail steel having proved its ability to withstand abuse as a rail, unprotected by any surrounding medium, possesses the quality of toughness and that this same steel rolled into reinforcing bars, the additional heating and rolling of which still further improves the steel, also possesses toughness. Then, when the bars are imbedded in concrete they possess resistance to stress far in excess of any demands that will ever be made upon them as a concrete reinforcement.

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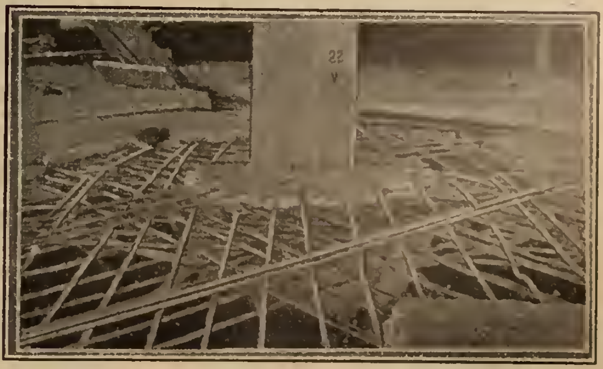
The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

In 1917, Professor Talbot, of the University of Illinois, conducted a series of tests on the Western Newspaper Union Building which was being wrecked for the new Union Passenger Station. This building was nine years old and of the flat slab type reinforced throughout with rail steel reinforcing. After various loadings which failed to exceed the elastic limit of any of the bars, a weight of about 1600 lbs. was dropped on the floor, above the column capital of the floor below, until the capital and the slab had been entirely shattered. This same method was followed on the floor slabs between columns until the bars were entirely exposed. The bars were then cut out with an acetylene flame. It should be noted that after this severe abuse the bars had to be cut—they did not break under the terrific impact of the weight, which is conclusive proof that Rail Steel Bars possess excess toughness as a reinforcing medium imbedded in concrete.

Specify your reinforcing steel to meet A.S.T.M. Specifications A-16-14 or equal.

Showing full floor load of 913 lbs. per square foot



Arrangement and condition of bars around column

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	25.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	25.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT: *Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL: †Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS: .Discount on flue linings is 55%

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What Dutton thinks of Tarvia after 11 years—

What better advertisement for Tarvia could we offer than this plain statement of facts from the Reeve of Dutton, Ont. Writing under date of Feb. 21, 1923, he says:

> "I believe that we have one of the oldest Tarvia pavements in Ontario and I am writing you to let you know the good service we have received from your pavement. This year is the eleventh year since the pavement was constructed by contract, on our Main Street, and since that time it has been subjected to heavy traffic of a mixed variety.
>
> "For the money we have spent, both construction and maintenance, I do not believe we could have selected a better pavement. The maintenance has only consisted in a periodical coat of 'Tarvia—B' and sand which proved satisfactory and inexpensive.
>
> "I believe that this maintenance, which was never neglected, is the real reason why I can say the pavement is in better condition today than when first laid.
>
> "I have no hesitation in recommending Tarvia pavements for Main Street in towns and villages who desire a first rate pavement at minimum cost.
>
> "We will require a few barrels of 'Tarvia—B' this year probably, as no maintenance was given last year."

Tarvia roads are not only firm, smooth, dustless and mudless all the year round—they are far less costly to build and maintain than any other type of modern highway. Because of these economies, the use of Tarvia insures the most miles of good roads that can possibly be built and maintained with the road funds available. There is a grade of Tarvia for every road purpose—new construction, repairs or maintenance.

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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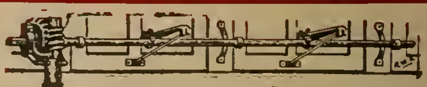

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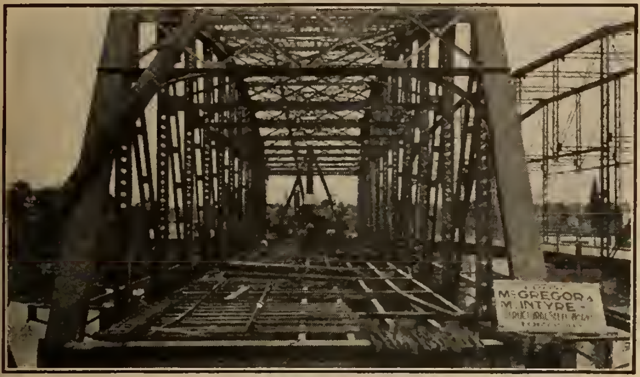

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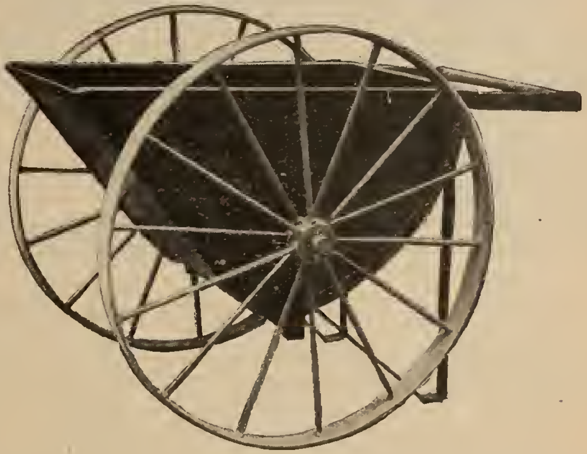

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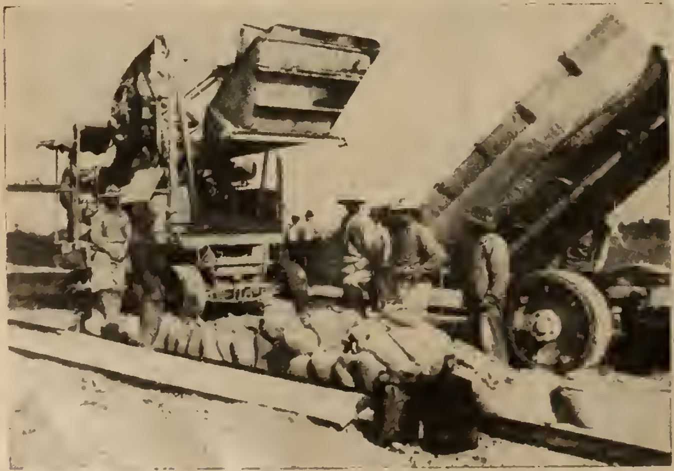

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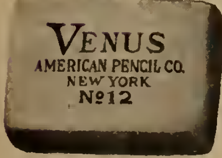

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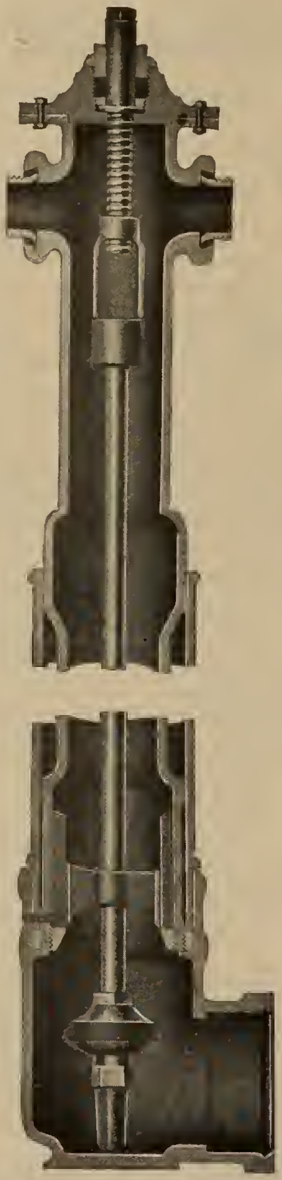

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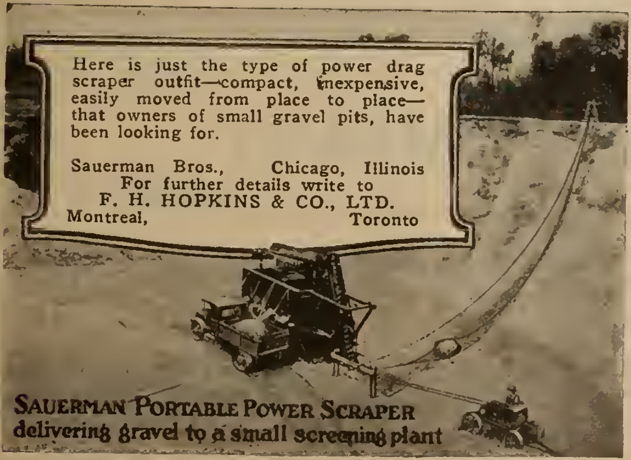

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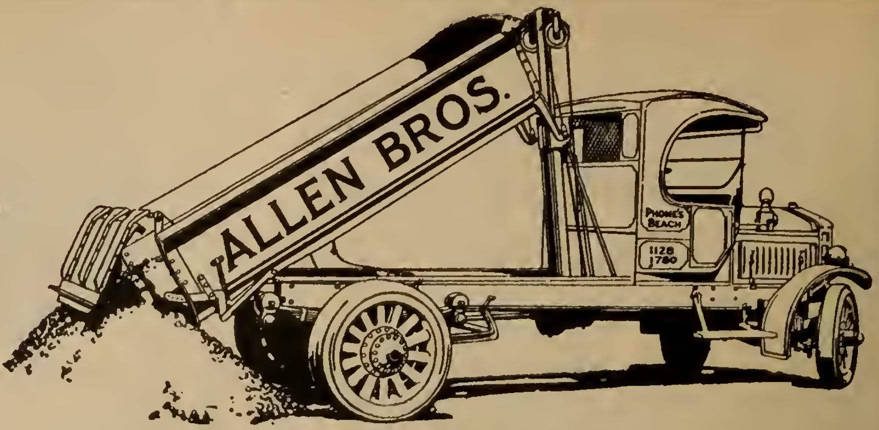

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For Blast Hole Water, Shallow Oil and Gas Well Drilling and Mineral Testing

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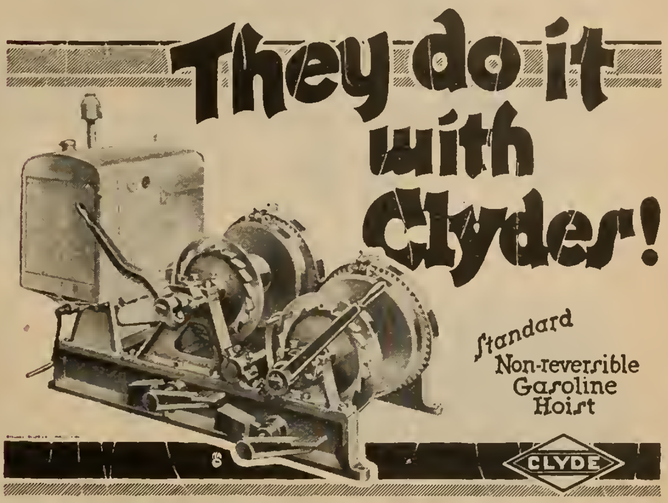

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Turbine Sewer Machine Co., 195 Eleventh St., Milwaukee, Wis.
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DEPARTMENT OF LABOUR
BOILER INSPECTION NOTICE
Excerpt from Regulations for the Construction and Inspection of Boilers
Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.
The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.
All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

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Minister of Labour.
D. M. MEDCALF, Chief Inspector of Steam Boilers.

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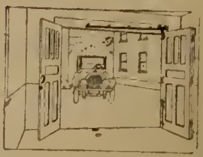

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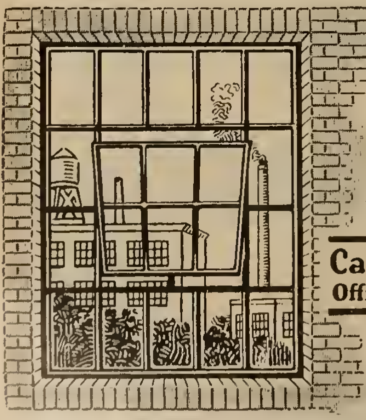
Maritime Provinces:—James Robertson, St. John, N. B.
Vancouver:—Messrs. Gordon & Belyea, Limited, 148 Alexander St.



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The name of the ORIGINAL steel WindoWall.
The symbol of superior QUALITY in material, patented design, workmanship and service.

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It is in a class by itself. Built by the oldest and largest manufacture's of cranes in the country. 17 different types, capacities 5 to 200-tons. Each and everyone backed by 50-years experience in the crane field.

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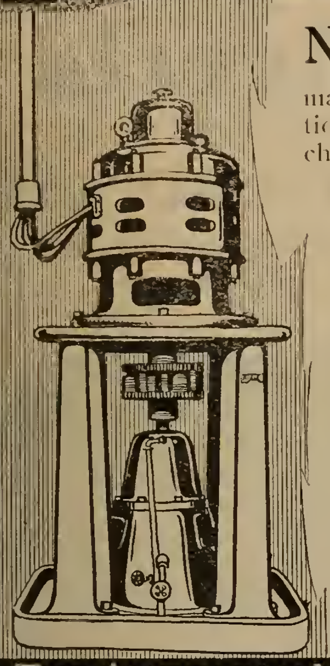

NATURALLY, there are a good many local conditions that affect the choice of a pump, but there must be some reason why so many plant engineers insist that no matter what the **type** of centrifugal used—it must bear the name of The American Well Works.

Fifty years' experience in the manufacture of all types of centrifugal pumps assures their satisfactory operation.

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General Office and Works
AURORA, ILL.

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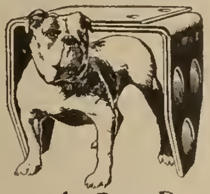
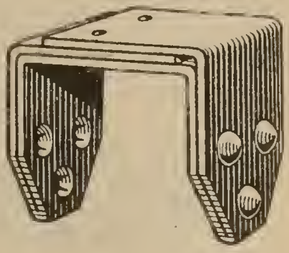
BULL DOG FLOOR CLIP



Put the BULL-DOG on *your* Pay-roll

With this device it is possible to secure the advantages of wood floors in reinforced concrete buildings—at an economical cost, at a vital saving of time, and with a reduction of 18,000 lbs. dead load per 1,000 sq. ft. Conceded by the leading architects and builders to be the best device of its kind and 100 per cent efficient. More than ten million sold last year on the American market.



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Winnipeg, Manitoba

Branches: Regina, Saskatoon, Calgary, Edmonton.

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Designing **Fabricating** **Erecting**

We have established an enviable record of consistent success on all classes of structural steel work, the Car Repair Shops shown being a recent example. We stand ready at all times to quote on jobs, large or small.

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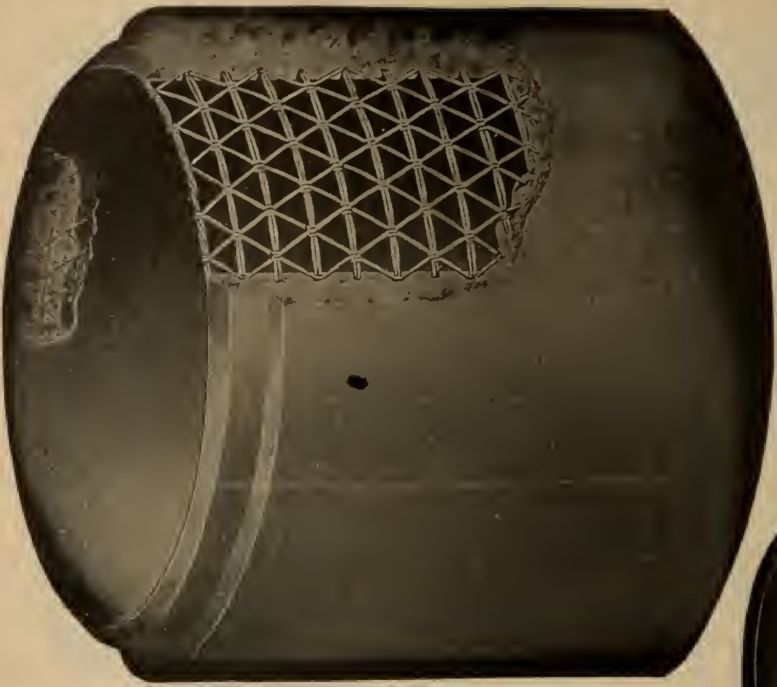

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and
Culverts
built from
Our Concrete
give maximum service
at minimum cost
(Large Stock on Hand)

Write us for Catalogue and Prices

Dominion Concrete Co. Limited
KEMPTVILLE - ONTARIO

This year
for
WATER MAINS
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Made - in - Canada

P H Bell and Spigot Steel Pipe
Dipped and Wrapped

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Sizes from 3 inches to 10 inches in Diameter

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Chemists and Metallurgists.

Expert inspection and tests on all materials and equipment.

Parties having Relaying Rails, Cars, Locomotives and other used equipment for sale, are invited to list same with us, in view of various enquiries from clients for such information.

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Branches throughout Canada, United States and Europe.

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Prompt Delivery

Any Quantity Rough Dimension, Timber—Square and Round, Rock Elm and White Oak Timber, White Pine, Hemlock and Spruce Lumber. All thicknesses. Can be dressed in transit.

Hardwood Lumber—all kinds, all thicknesses, all grades. In our Toronto yard.

Hardwood Flooring, grade Factory and Better.

Let us quote you prices.

HALL BROS. LIMITED

26 Queen St. East, Toronto Phone: Main 2806

We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
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Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.

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Economy-Speed-Efficiency

are essential in the handling of materials and can best be obtained with the

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Clam Shell and Orange Peel Buckets

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Flexible and Flange Pipe
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Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
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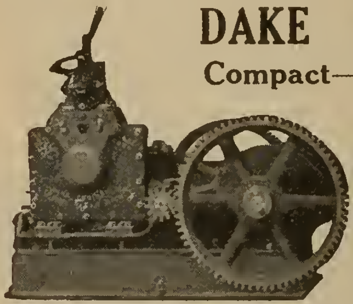

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Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

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Pacific Coast Pipe Co., Ltd.
Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter
Continuous Stave Pipe
from 16 in. to 12 ft. diameter
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"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
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INTERNATIONAL ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
Company, Limited
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"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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PUSH BUTTON ELEVATORS

Full Selective Control

With a bank of buttons in the car numbered to correspond with the several floors, together with one push button outside of each landing doorway. A momentary pressure on a button starts the car which proceeds to the proper floor where it stops automatically.

Up and Down Control

A simpler and less expensive control consisting of two push buttons in the car and two similar buttons at each landing. Pressing the up button starts the car going upwards and it continues to run while the button is pressed, stopping when the button is released. Similarly pressing the down button operates the car downward. The car stops, of course, automatically at the top and bottom landings.

Both controls are supplied with door or gate interlocks so that the car cannot be started while a door or gate is open and these cannot be opened except when the car is at the landing.

The
TURNBULL ELEVATOR COMPANY
LIMITED

HEAD OFFICE & WORKS:
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MONTREAL BRANCH:
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"Dominion" Wire Rope

Flexibility and Strength
for the
Stiffest Requirements

Let us quote you for
BLOCKS, CLIPS, THIMBLES AND SHACKLES

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Also at: TORONTO - WINNIPEG

THE BIG THREE!

"Marion" Steam Shovels
and Ditchers

"Industrial
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Cranes

"Ransome" Concrete
Mixers

Fast
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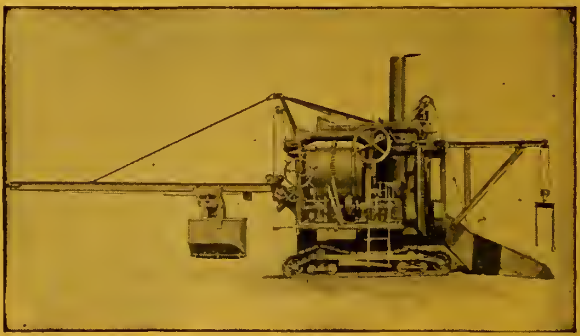

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TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
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Telephone Main 3420

Vol. 37 Toronto, October 10, 1923 No. 41

Contract Record and Engineering Review

Wood Stave Pipe

For long and Satisfactory Service

"Pacific" Wood Pipe is in use today from the Atlantic to the Pacific Coast for Hydro-Electric development and is giving every satisfaction: Our specialty, complete construction.

This 10 ft. dia. Wood Pipe has recently been completed by us for the Neva Scotia Power Commission's development at St. Margaret's Bay, N. S.

Write us for information

Pacific Coast Pipe Co., Limited

1551 Granville Street - - Vancouver, B.C.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

REES RoTURBo

Self Regulating PUMPS

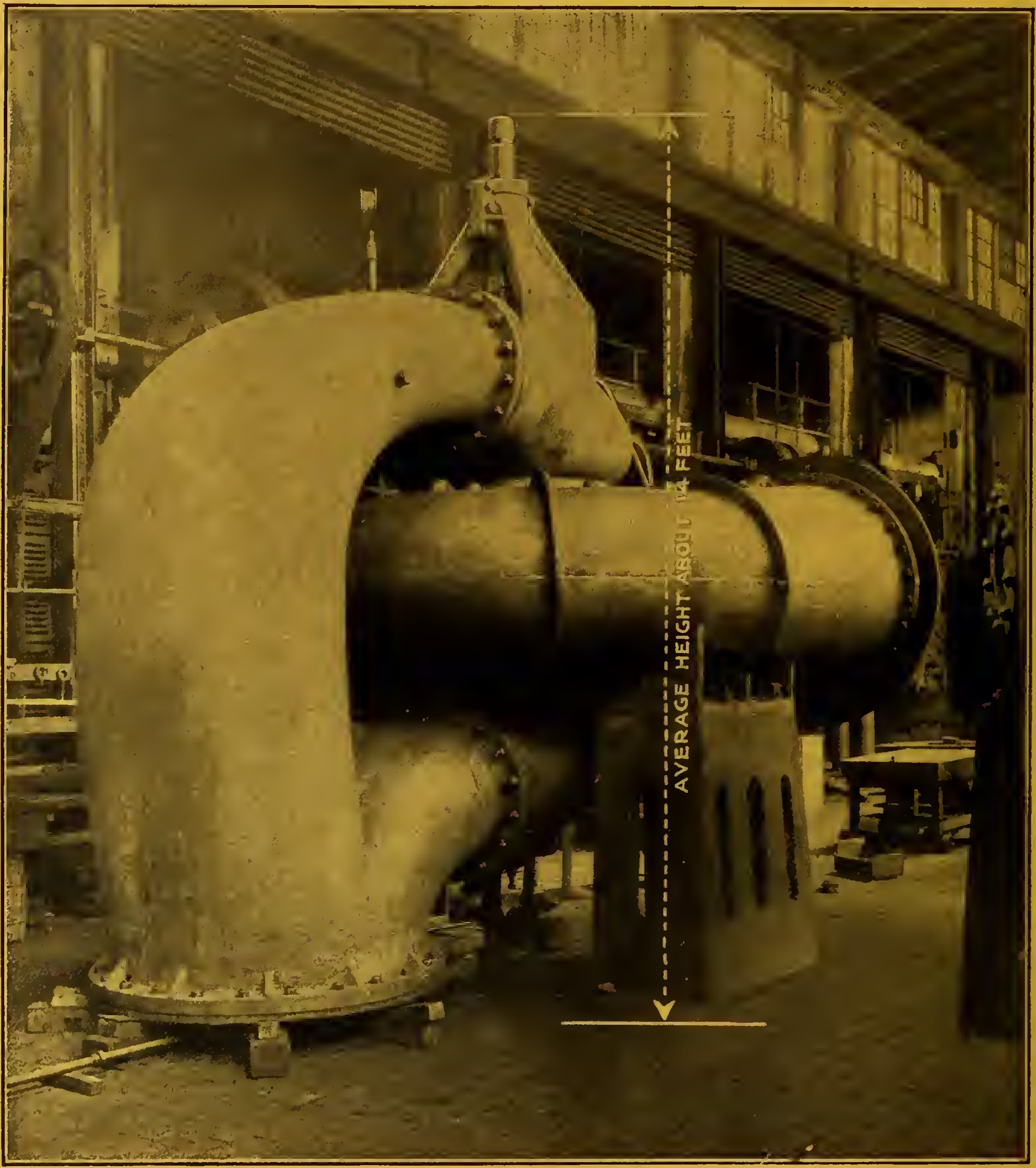

Illustration shows one of TEN REES RoTURBo PUMPS installed or on order for The St. John Drydock & Shipbuilding Co.

The three main pumps, "one of which is shown above" have an average capacity of over 250,000,000 Imperial Gallons per 24 hours and a maximum capacity of over 300,000,000 Imperial Gallons per 24 hours.

Ask for the REES Catalogue and any desired information.

THE GOLDIE & McCULLOCH COMPANY, LIMITED

Head Office and Works, GALT, Ontario, Canada

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BRITISH COLUMBIA AGENTS:
Robt. Hamilton & Co.,
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Make Concrete Blocks, Concrete Brick, Lintels, and Sills during the winter months and keep your labor employed.

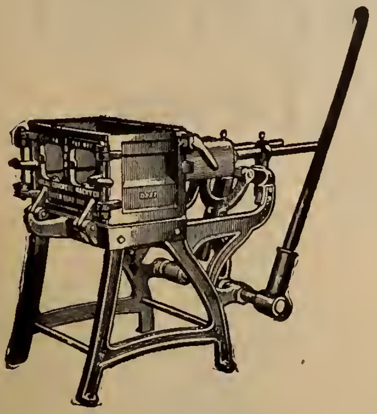

Fig. 910

IDEAL CONCRETE BLOCK MACHINES THE WORLD'S STANDARD

The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.

The Ideal Block Machine makes every style of block required.

—Fully described in Catalogue No. 22-B-1

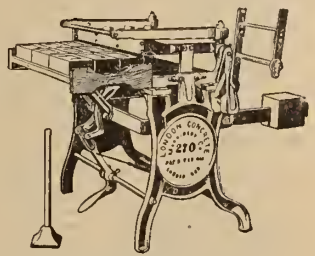

Fig. 91

LONDON CEMENT BRICK MACHINE

Hand Power

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression.

This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.

Ideal Concrete Products Plants everywhere have been enjoying prosperity during the past year. **WHY?** Because the Ideal Concrete Blocks are now recognized as standard building materials and in large demand in every vicinity where buildings are being erected.

The machines illustrated herein are all that is required to start in the business. A complete plant can be installed for a few hundred dollars. The profits in the business will more than justify the expense.

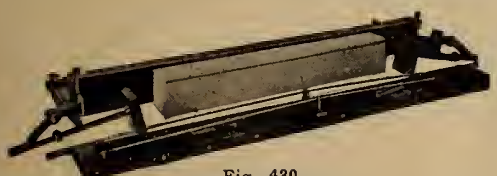

Fig. 430

LONDON ADJUSTABLE SILL, STEP AND LINTEL MOULD

The London is the Only Absolutely Adjustable Mould on the market. It makes sills, steps and lintels any size, and with any bevel. Saves the price of itself in one building.

—Described in Bulletin O-R-S

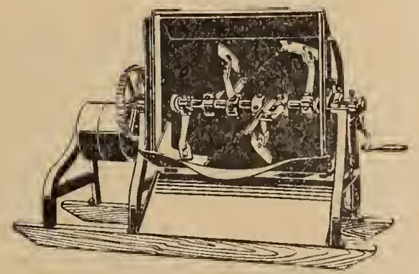

Fig. 6051. London Chain Spade Mixer, on Skids With Tight and Loose Pulley

This machine is particularly suitable for stationary plants, for mixing semi-wet concrete for making concrete blocks, tile, or cement brick. This kind of concrete requires considerable tempering with a very small quantity of water. The London Chain Spade Mixer was designed particularly for this class of work.

—Described in Bulletin 49-M-1

What we have done for others we can do for you

Full particulars on request.

Made in Canada

We manufacture concrete Mixers, Hoists, Elevators, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

Worlds Largest Manufacturers of Concrete Machinery

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O. E. Barnard, Sherbrooke, Que.
Foss Machinery Limited, Montreal
Harvard Turnbull & Co., Toronto

General Supply Co. of Canada, Ottawa
J. E Middleditch, Windsor, Ont.
E. A. Muir, Port Arthur, Ont.
Dominion Equipment & Supply Co., Winnipeg.
Gorman's Limited, Calgary and Edmonton

MacKenzie Supply Co., Regina, Sask.
Building Products & Fuel Ltd., Saskatoon, Sask.
C. T. Nelson, Victoria, B.C.
B.C. Equipment Co., Vancouver.
Whitelock & Marlatt, Moose Jaw, Sask.
West Kootenay Equipment & Construction Co., of Nelson, B.C.

McCRACKEN SEWER PIPE
Is Winning Canada's Favor

This is London's Opinion

"London, Ontario, March 5th, 1923.

John E. Russell Co. Limited,
Harbor Administration Bldg.,
Toronto, Ontario.

Dear Sirs:

McCracken Concrete Sewer Pipe has been used in large quantities by the city of London, under my direction, continuously since its introduction into Canada some years ago.

I have much pleasure in stating that we find it absolutely satisfactory in every way and have no hesitation in recommending its use for all sewerage and drainage purposes.

H. A. BRAZIER,
City Engineer, City of London."

This is typical of the letters we are continually receiving from engineers in every section of the Dominion expressing in enthusiastic terms their approval of McCracken Concrete Sewer Pipe. These testimonials are the strongest kind of evidence that McCracken Sewer Pipe makes good in the most trying service.

It is manufactured in accordance with standard specifications issued by the American Society for Testing Materials, and inspected by the Canadian Inspection and Testing Company Limited. And because of the absolutely uniform high quality of this pipe—every pipe measures up to the same high standard as every other pipe. In first cost and last cost McCracken is unsurpassed by any other sewer pipe.

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"The Pipe That Endures"

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CANADIAN MM Co MEAD-MORRISON CANADIAN MM Co

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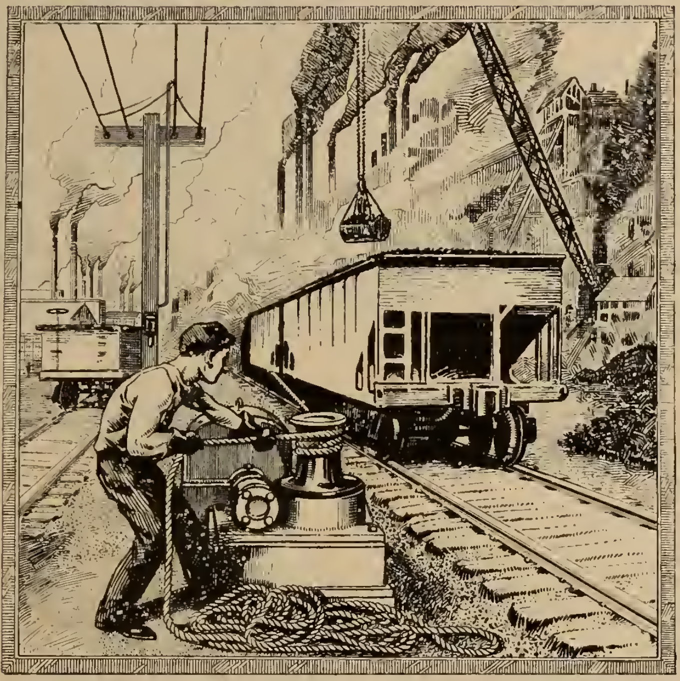

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All Koehring Built!

KOEHRING draglines are all Koehring-built from the ground to the boom peak — from the foundry through the machine shops to the loading of the flatcars in the erecting shops.

This alone makes possible strict adherence to Koehring Heavy Duty standards in every detail — and when you know the detail of Koehring construction, you will recognize All-Koehring-built as an unusual value in excavating machinery — as an important, additional factor of greater capacity performance, lowest maintenance and longest trouble-free service life.

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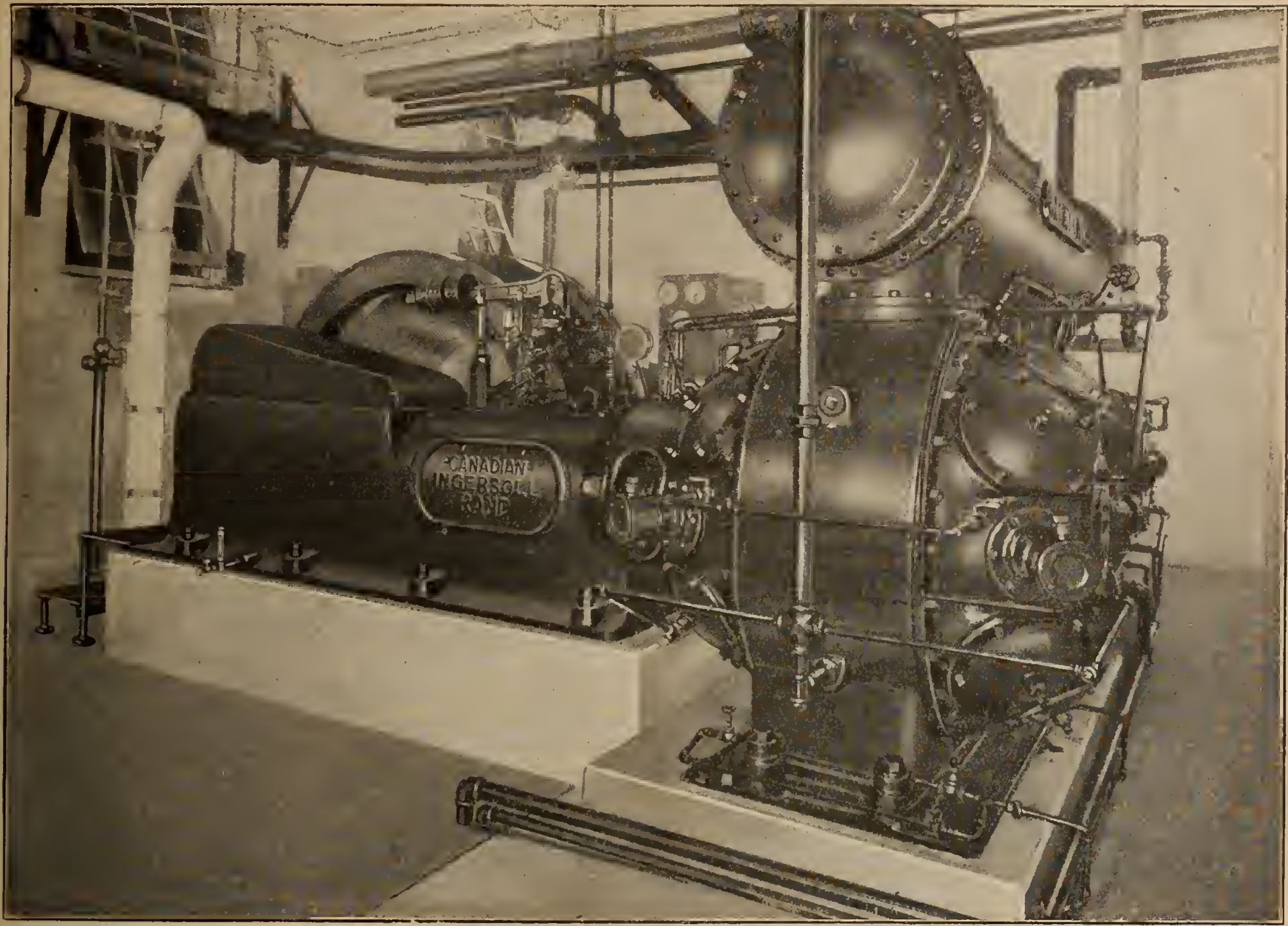

At Westinghouse—

Few people have had better opportunity to judge the value of motor driven compressors in general than the large electrical concerns on this continent who have advocated the use of this type for many years.

That most of these firms have installed Ingersoll-Rand Class "PRE" Compressors in their own shops in the first place, or to replace machines of older types indicates the high esteem in which they are held.

To meet the increased demand for air at its Hamilton Plant, the Canadian Westinghouse Company recently sold its Ingersoll-Rand steam driven unit to an Eastern Coal Co., and installed the 18" stroke Class PRE-2 unit shown above. This machine is direct-connected to a Westinghouse 355 h.p., 2200 volt, 66 cycle, two phase, 200 r. p. m. synchronous motor and supplies air to a host of air-operated appliances used throughout the works.

The Automatic Five-Step Clearance Control with which this machine is equipped permits regulation at full, three-quarter, one-half, one-quarter and no load, with corresponding reductions in power consumption.

Many mines, industrial concerns, railroad shops, etc., who have cheap hydro-electric power at hand, are replacing their older types of compressors with these up-to-date units providing closer regulation and better efficiencies than any other type.

Bulletin K-317 just off the press describes these machines in detail. Write for a copy or ask our nearest branch to show you why it will pay you to install Class "PRE" compressors.

Canadian Ingersoll-Rand Company, Limited

Sydney Sherbrooke Montreal Toronto Cobalt
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Refer U. S. enquiries to Ingersoll-Rand Co., 11 Broadway, New York

Ingersoll-Rand

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  - Barrett Company, Ltd.
  - **Brantford Roofing Co.**
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- Shingle Stain Oil
  - Barrett Company, Ltd.
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How New York Subway Could Pay The City $48,837

GREAT interest was manifested by the announcement that the City of New York would receive $48,837 as its December share of the net profits of the Interborough Rapid Transit Company—that a deficit of $194,000 in the last quarter of 1921 had been turned into a profit of $216,000 in the same period of 1922 in spite of an increase in the cost of coal of $669,000.

This is largely due to economies effected by the installation of various modern appliances—turnstiles, multiple-unit door control, etc.

The big lesson this saving teaches every executive is ECONOMIES CAN BE EFFECTED BY ADOPTING MODERN MACHINERY. This is especially true in handling materials—and Jeffrey Equipment has demonstrated it time and time again in every field of industry.

Jeffrey labor-saving Material Handling Machinery includes a complete line of Conveyors; Chains; Elevators; Portable Loaders and Unloaders; Coal and Ashes Handling Equipments; Industrial Locomotives; Crushers; Pulverizers, etc.

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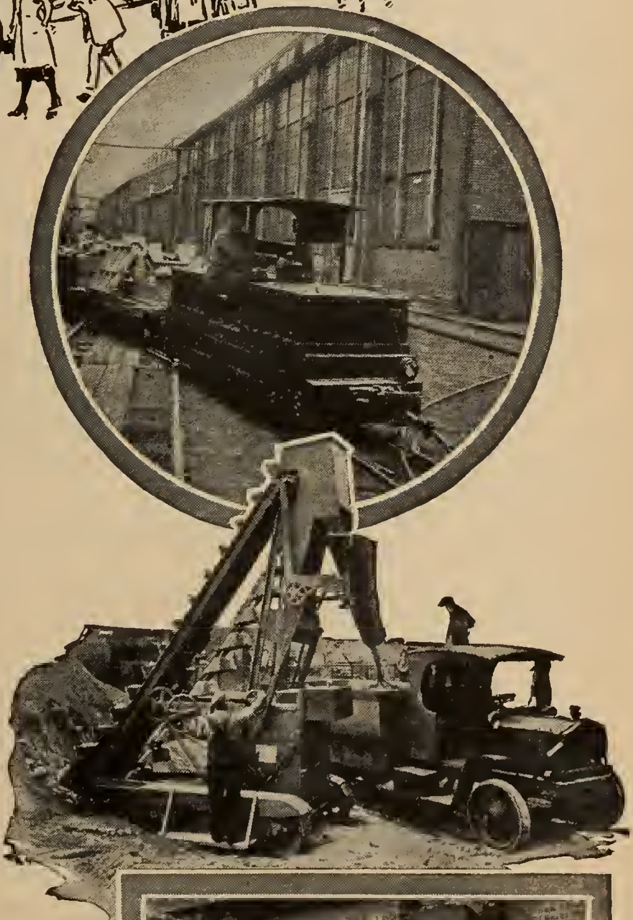

Track supports for the new Union Station in Chicago are of concrete. This picture shows one of the tracks laid on short concrete cross ties mounted on a ten-foot wide concrete base.

25 Acres of Concrete in Chicago Union Station

Practically all tracks in the new Union Station in Chicago, for the joint use of four large railroads will be placed on concrete slabs.

In the train shed proper the rails will rest on short ties embedded in concrete roadbed, that in turn rests on a concrete slab 10 inches thick and 14 feet wide. All approach tracks, with the exception of one section 800 feet long, laid three years ago, will be laid in ballast on top of a 10-inch concrete slab. The total area of concrete slab track support will be slightly over 25 acres.

On many of the Chicago Union Station tracks, a concrete base is used and the track laid and ballasted on it in the usual manner.

Four Chicago Railways Invest In Permanence And Safety

PROBABLY no other railway tracks in the world will be subject to more severe wear than those now being completed at the new Union Station at Chicago. For that reason practically all tracks will be laid on concrete slabs.

The officials of these railways found such a striking reduction in maintenance costs effected by a section of concrete track support laid in 1920, they did not hesitate to adopt concrete construction for this subsequent work.

The use of concrete for railroad construction has long since passed the experimental stage. Each year sees a decided increase in its use for this type of construction where permanence and lower maintenance cost is the paramount consideration.

Railroad officials have come to realize that the same qualities that have won for concrete nation-wide recognition as the ideal paving material to insure Highways of Permanence are the qualities necessary to insure for railroad construction low maintenance cost, permanence and safety.

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2—This Barber-Greene is used because it reaches [illegible] feet farther than a crane in a beach sand plant near Cleveland.

3—Loading chert direct from bank to truck with a Barber-Greene Loader which cuts the payroll by 25 men and the overhead by 66%.

4—This permanent Barber-Greene Conveyor increases washed and screened gravel production 350 tons per day for the White Marsh Sand and Gravel Co., near Baltimore.

Replacing Shovel Men and Locomotive Cranes

Neither the age-old shovel nor the formidable locomotive crane are always the best things to use for keeping down costs and getting production.

Each is very well in its place — but there are other types of equipment that often do the work more rapidly and more profitably.

Barber-Greene Portable Conveyors and Barber-Greene Bucket Loaders are intermediate equipment of this sort. In hundreds of cases they are an absolute necessity to profitable operation. In others they merely increase profits.

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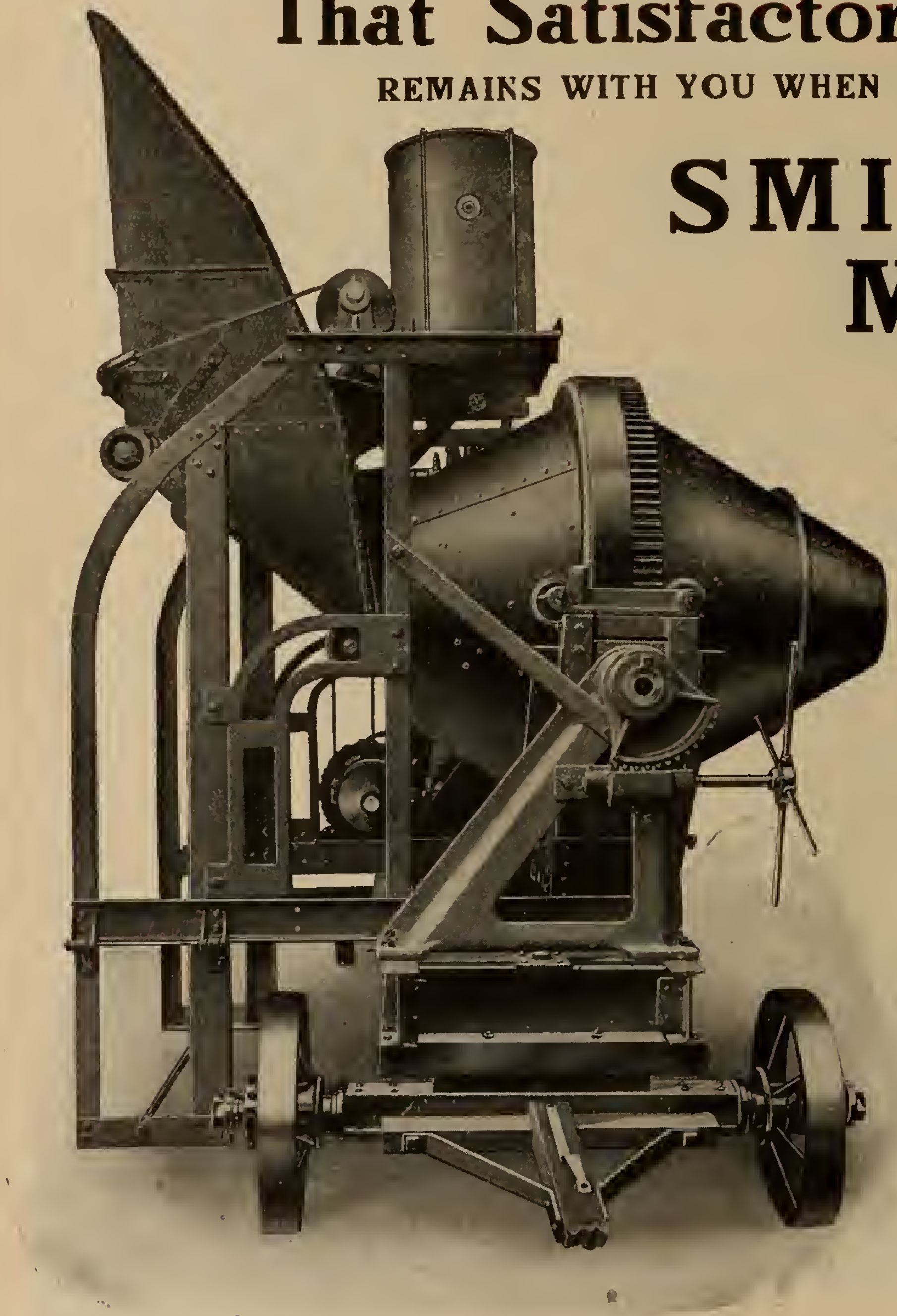

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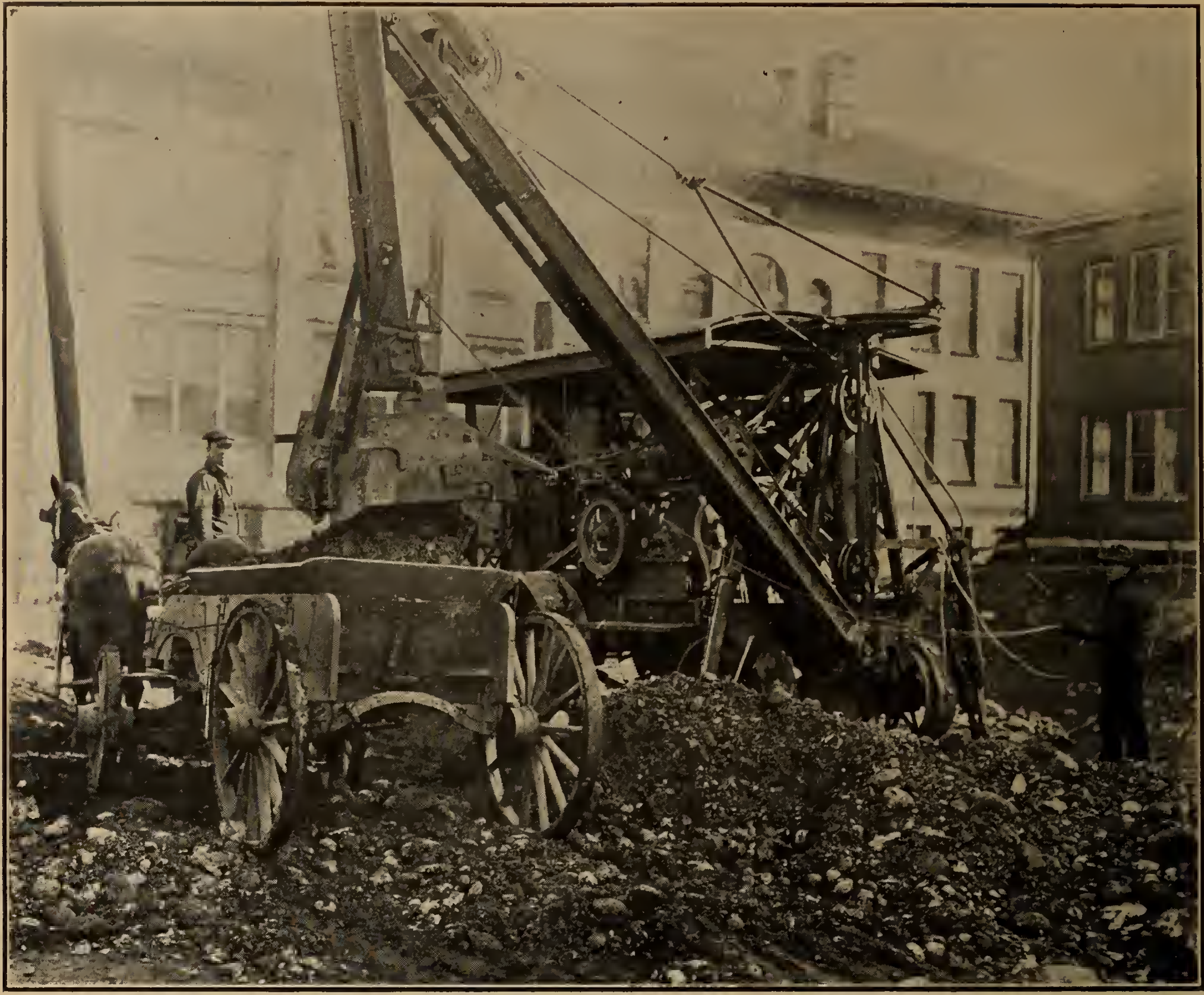

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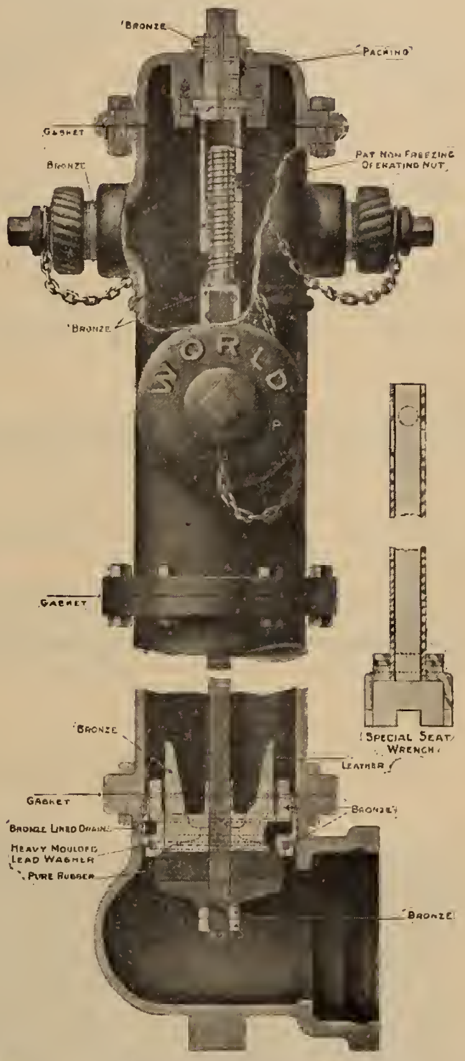

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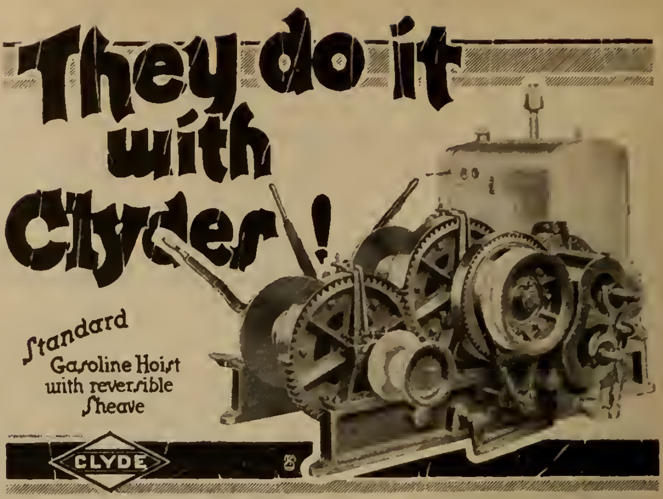

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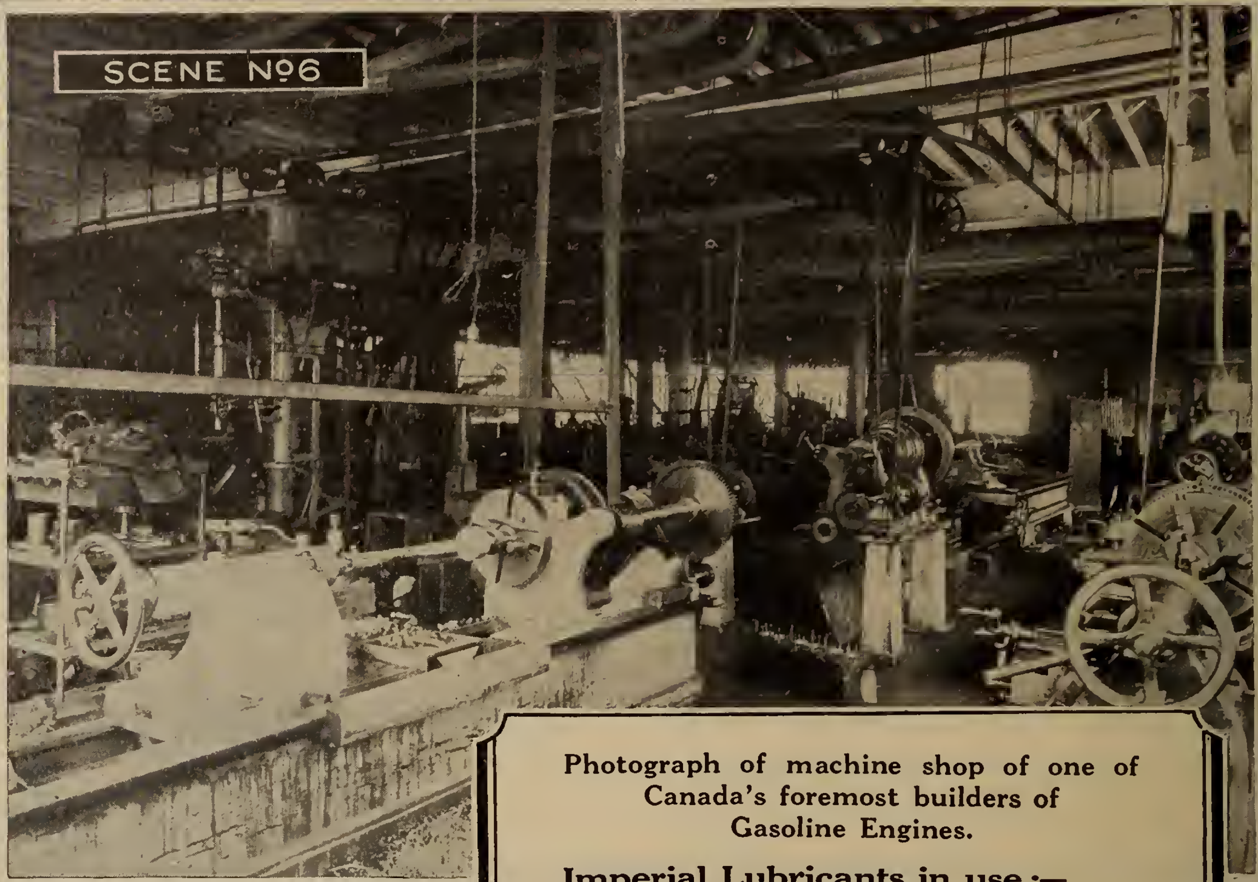

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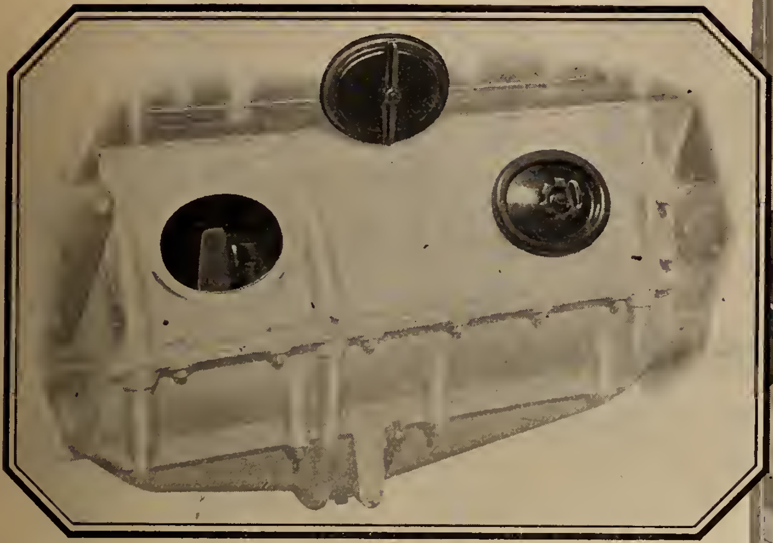

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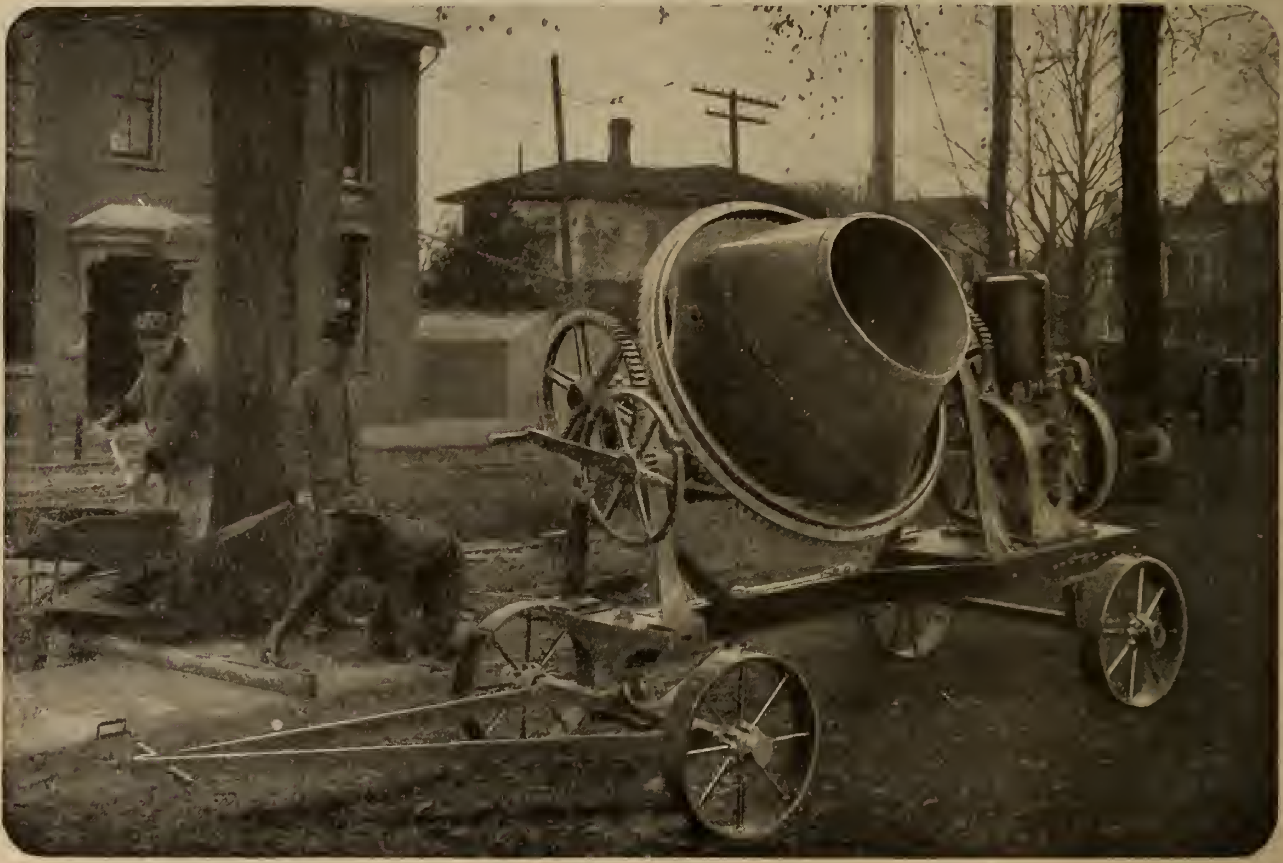

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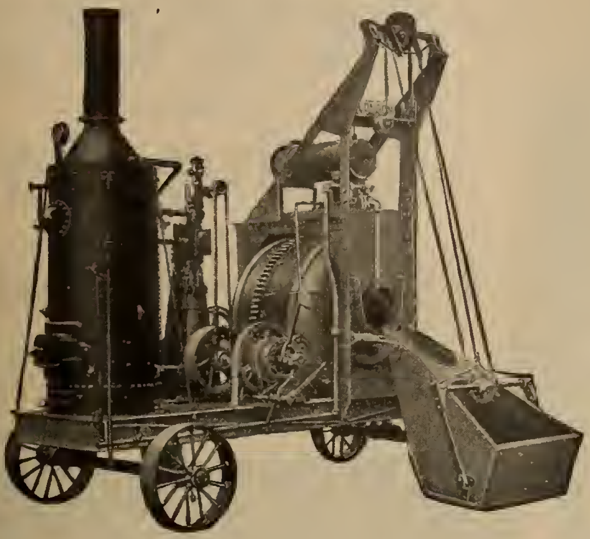

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ESTABLISHED 1886

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A National Journal for the Construction Interests of Canada, reaching Architects, Engineers, Contractors, Municipal Officials, etc.

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An Aid to Engineers

When the Department of Public Works of Canada decided some time ago to investigate the necessity for and the best methods of obtaining an increased depth in the tidal estuary of the Fraser River in British Columbia, the Board of Engineers appointed for that purpose proceeded in a way that is deserving of commendation. They saw that, in order to be able to advise sagely, it was desirable to acquaint themselves with all the literature pertaining to the subject of river improvement, and consequently, they undertook the review of articles which had appeared in the proceedings of engineering societies and in the technical press. In this way, each member of the Board was given a description or history of works carried out under analagous conditions and also the benefit of other men's experiences as set forth in papers written by them. Realizing that other engineers, particularly those of the Public Works Department and those whose duties were connected with questions of navigation, would appreciate the privilege of having available in abbreviated form a large number of papers dealing with such a subject, the idea was conceived of having a number of the reviews published in a volume. This has now been done, proper authorization for the publication having been obtained from the societies or authors concerned.

The reviews vary considerably in the degree to which they follow the original articles, some giving verbatim the most essential and important parts, while others are prepared from two or three papers on the same subject and combine these papers to bring out the main points of interest and the chronological sequence of construction with the results produced.

This idea is a most worthy one for it serves to bring to the attention of the engineer all data that will be valuable to him in work with which he is connected. Quite frequently engineers, especially those in government departments, are called upon to carry out projects about which they have little knowledge largely because they have not obtained any experience in the particular line of work concerned. By having a digest of technical articles available, the engineers are enabled to acquire necessary data and information and therefore more faithfully to carry out their duties. Of course, most engineers keep in touch with developments through the reading of their technical papers, and many even make a practice of filing articles that relate to their own special work, but in government departments, where the personnel changes frequently, engineers do not always have on hand the information that would serve them in the best manner. Consequently, a little compilation of the type referred to performs a very helpful service. This apparently is realized by the Department of Public Works themselves, as they have indicated that this first review will be followed by subsequent ones dealing with other special lines of work.

The Construction Situation at the Moment

Contemplated new construction reported during September by MacLean Building Reports, Ltd., totalled $50,779,000, or $11,702,200 more than a year ago. There seems no room for doubt now, but that activity for the rest of the building year will be considerably higher than had been rather commonly expected.

Pronounced activity has been in evidence this year in the construction of public works and utilities. During the first nine months of 1923 contracts were awarded in the Dominion for 219 bridges, costing $3,738,800; 66 dams and wharves, $3,379,200; 190 sewer and water systems, $3,677,200; 1087 road construction contracts, $37,809,100; and 250 general engineering projects, costing $28,025,000. This represents a total of $76,629,300 expended on engineering developments alone, or $24,630,300 more than during the same period of 1922. With the return of lower interest rates, provinces, counties, municipalities, railroads and certain other corporations will now institute building programs which have been latent for

No. 102

Canada's Engineers—J. G. W. Campbell

J. G. W. Campbell, C.E., town engineer of Truro, N.S., commenced his professional experience in the town of North Sydney, N.S., where for two years he was assistant to Messrs. Morrison & Maxwell, civil engineers in charge of the construction of the sewerage system of the town. He then spent one year with the Mabou & Gulf Railway & Mining Co., Mabou, C. B., being engaged in the design and construction of bankheads and bridges and on railway location and construction. For the following nine years Mr. Campbell was with the town of Sydney Mines, N.S., as town engineer, during which period he had charge of the design and construction of the water and sewer systems of the town together with all other municipal work. He then spent one year each with the Royal Canadian Engineers at Halifax, N. S., in charge of building construction and other works and with the Nova Scotia Tramways and Power Co., Halifax, N.S., as draftsman and on the construction of the new gas and coal storage plant. Then for about two years he was on the city engineer's staff, Halifax, N. S., being engaged on several branches of municipal work. At present and for the past four and one-half years, Mr. Campbell has been town engineer of Truro, N. S. Under his jurisdiction a large amount of concrete sidewalks and water and sewer extensions have been completed as well as reinforced concrete bridges, concrete pavement and Tarvia Roads. He has also acted as waterworks superintendent. Mr. Campbell is an engineering graduate of Ohio Northern University, and has been an associate member of the Engineering Institute of Canada since 1905.

Mr. J. G. W. Campbell

many years. It is now more than ten years since interest rates have been as low as they are to-day, and this condition will likely become more favorable during the next two years.

The total awards for Canadian construction for the month of September according to MacLean Building Reports, Limited, were $23,382,100. While this total shows a falling off of $4,106,600 from August, it must be remembered that the autumn is a period of completion rather than inception of important new work. The decline is natural and seasonal. Residential building accounted for 34.7% of the September total, and amounted to $8,091,300. Business building amounted to $5,374,200, or 22.6%; industrial building, $816,700, or 3.8%, and public works and utilities, $9,099,900, or 38.9%.

The great war crop of 1915 has been left behind by a hundred million bushels. The vast flood of grain is moving eastward from the prairies from what is estimated to be the greatest harvest in Canada's history. A leading paper poignantly says, "if the people of this country were not so strangely pre-disposed at this time to suspect that every egg is addled and that every to-morrow is going to be a disagreeable day, the enormous crop of 1923 would set this country singing from coast to coast ,and everyone would begin to be as busy and happy as bees in clover." Business generally is taking on a rapidly improving aspect, and to observe another significant sign, one need but reflect that unemployment has almost ceased to exist in Canada. Immigration is on the increase and there will constantly be more people to shelter.

Meetings of Toronto Branch, E. I. C.

The Engineering Institute of Canada, Toronto branch, has determined upon the following programme for October, 1923:

Friday, October 12, 12.30 p.m.:—Luncheon meeting in the King Edward Hotel, addressed by E. J. Mehren, vice-president of the McGraw-Hill Co. Inc., and editor of "Engineering News-Record." Subject: "Random Thoughts on Engineering Purpose"—a frank discussion of the changing views respecting the legitimate status and work of the engineer. Tickets, $1.00, procurable at the door.

Thursday, October 18, 8.15 p.m.:—Inaugural address of the Chairman of the Branch. Subject: "The Rise of the Engineer"—a review of his contributions to civilization and of his struggle to gain professional recognition from the days of Brindley and Smeaton down to the present.

Thursday, October 25, 8.15 p.m.—Address by the Honorable George S. Henry, Minister of Public Works and Highways for Ontario. Subject: "The Highway Situation in Ontario."

Unless otherwise indicated all meetings of the branch will be held in Room 22, Mining Building, University of Toronto.

Inquiry for Galvanized Sheets

An importer desires prices c.i.f. Batavia, of plain galvanized sheets, sizes 24 and 28 1/32 in. Further details may be obtained from the editor, referring to enquiry No. 2498.

New Sand and Gravel Plant at Ivanhoe, Ont.

A. W. Robertson Ltd. Have Erected an Unusually Efficient Screening and Washing Outfit at a Pit That is Especially Suited for Economical Working—Output is of Very High Order

A general view of the plant

In Hastings County, Ont., a few miles from the village of Ivanhoe, is located the most recently built sand and gravel plant in the province, that of A. W. Robertson Ltd., from which shipments in large quantities are just commencing to be made. It is a large capacity plant with a possible production of as much as 2,000 tons per day. The facilities for handling the large output of sand and gravel in all its various stages of preparation for the market are exceptionally up-todate and efficient. Indeed, it is impossible to imagine a plant more splendidly designed and equipped and it is doubtful if there is in the whole of the country any sand and gravel outfit that can compare with this one either in efficiency of production or in quality of output.

The unusually high grade character of the sand and gravel which this plant of A. W. Robertson's produces is due primarily to an exceptionally fine bank of raw material. Rarely does one see so superior a brand of pit-run located in a position so advantageous for economical handling. Of the 400 acres of land which are owned by the company at least half is gravel-bearing in the form of a hill about 225 ft. high. Test pits sunk at various points over the site indicate that gravel may be expected for the entire depth. The quality of the material may be best judged from an observation of the face of the pit, where the steam shovel is excavating. Here the exceptionally high grade nature of the gravel is apparent. Composed of hard, dense stones, well proportioned with sand and fines and with a marked absence of large rock, it is obviously an ideal material for either concrete, ballast or roadwork. A striking feature which the pit face discloses in the practical absence of overburden. Only very occasionally does it exceed the thickness of the sod. Further, no veins of clay or stratified rock are evident, so that it is readily apparent how satisfactory in quality the material is and how economically it may be worked. Full advantage has been taken of these natural superiorities with the result that the washed sand and gravel as available for the market is unusually clean, dense and well graded.

Plant is the Best that Could be Designed

When A. W. Robertson Ltd. decided to develop the site they had their engineer study sand and gravel design all over the continent. Several of the largest plants on the other side of the line were visited so that the Ivanhoe plant incorporates all that has been found best in sand and gravel washing practice, as carried out on the continent. As a result of this careful study prior to the development of the site, A. W. Robertson Ltd. have a plant which is hard to beat. Exceptionally substantial in construction, thoroughly efficient in design, it is a fit counterpart of the splendid bank of high quality material to which reference was made in the last paragraph.

The site is close to the Canadian National Railway line from Belleville to Madoc, Ont., from which line spurs have been run into the plant. All told, including the spurs from the main line and pit sidings, 2½ miles of track have been laid to serve the property. The pit is a side-hill cut with the digging level about 75 ft. up the slope. By opening the cut at this level, instead of at the bottom, the material

Substantial construction, economical operation and high-grade output characterize this sand and gravel plant

The No. 70 Bucyrus shovel which is used in the pit. Here it is grading right of way for spur tracks does not need to be mechanically lifted to the plant, but can flow from the dumping hopper to the belt by gravity. A No. 70 Bucyrus railroad shovel with a 2½ yard bucket is used for excavating. Digging commenced at the far end of the site and the face is being advanced toward the plant. The proposed plan of operation is to work along the side of the hill past the plant to the limit of the site and then return and work another face further in on the same bench.

Plymouth gasoline locomotive pushing a train of dump cars up a stiff grade

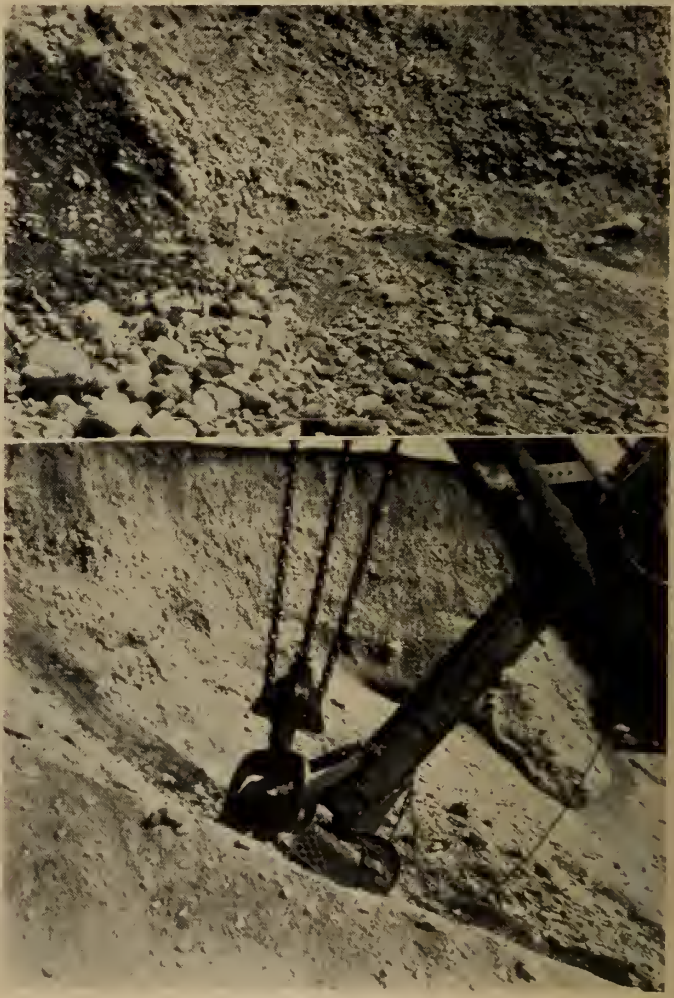
Comment has previously been made of the excellent quality of the gravel. It is found that it responds nicely to the shovel, breaking readily with no cementing. The absence of any considerable overburden means that little stripping is carried out, as there is only sod to remove. The shovel loads into 6-yard standard-gauge dump cars, which are drawn by a Plymouth gasoline, gear-driven, 7-ton locomotive. Ten-car trains will be the rule when the dumping trestle is completed, but at present, six cars can be accommodated satisfactorily. Ten minutes is all that is required for a round trip, including loading, hauling to the trestle, dumping and the return of the empties. This Plymouth locomotive is one of the most valuable pieces of equipment around the plant, as it serves not only to haul dump cars but is used also for shunting and spotting the standard railroad cars.

The plant viewed from the dumping trestle

The dumping trestle is situated about two hundred yards from the present face. The dump has been made exceptionally large, so that there will be an ample supply of gravel on hand for the operation of the plant at night without the necessity of keeping the pit going.

The dump material, which is retained at the toe of the hill by timber cribbing, flows by gravity into a large plank hopper which is carried on heavy concrete foundations. From the hopper outlet the gravel is carried by an apron feed to a belt which elevates it to a scalping screen, 12 ft. long by 60 in. in diameter, having 2½ in. perforations. The oversize passes to a No. 5 McCully gyratory crusher set with a 2 in. opening, the crusher output being then elevated by belt and discharged on the belt first referred to, running from the hopper to the scalping screen. In this way the crusher run is screened again to ensure correct grading before it is permitted to undergo further sizing.

The gravel that passes through the scalping screen is elevated by belt and discharged either in a bin for



Views taken in the pit

marketing, as unwashed "pit run" or to the washing screens for cleaning and grading. The washing screens are three in number, with 1¼ in., ⅝ in. and ¼ in. perforations, respectively. These screens each measure 36 in. x 72 in. x 96 in. Water at 50 to 60 lbs. pressure is used for washing, the stone which passes the screens being discharged into suitable bins. The sand—all that passes the ¼ in. screen—is thoroughly cleaned in a sand washer and discharged into the sand bin, or if desired, it may be dumped directly into cars.

The bin, which is 81 ft. long, 17 ft. wide and 38 ft. high, is divided into five compartments, accommodating pit-run, 2 in. gravel, 1 in. gravel, pea stone and sand. There is a siding on each side of the bin, each compartment having four chutes, two on each side. The bin is substantially constructed of 3 in. x 10 in. planking, with 10 in. x 10 in. posts and waling, securely retained by heavy iron rods longitudinally and transversely. It is carried on 168 piles, carried to a penetration of 18 to 20 ft. Over the piles is placed a 2 ft. slab of concrete with concrete walls and partitions 5 ft. high and 2 ft. thick, on which is carried the timber superstructure. Around the entire bin, drainage is provided by a trench filled with stone. The compartments are each filled to spouting level with stone to afford adequate drainage.

The rest of the plant is equally as substantial. The trestle work supporting the belts, scalping screen, etc., is composed of 8 x 8 or 10 x 10 posts with 2 x 8 bracing, the posts being carried on concrete footings. For the support of the crusher, a heavy concrete pier was constructed.

The power for the plant is steam at the present time, although it is planned to use electricity later on. The belts, scalping screen and crusher are belt driven, while the washing screens are rope driven from a 120 h.p. engine, supplied by two 60 h.p. boilers.

Water Supply

The water supply for washing purposes is obtained from a small stream a quarter of a mile away from the plant. This stream has been dammed to provide a storage pond of about 12,000,000 gals. capacity and the water is pumped by a Morris centrifugal steam driven pump through an 8 in. pipe, for a distance of 1,400 ft., to the plant, at which is located an 18,000 gal. reserve tank. When the pump is operating, it supplies the nozzles directly, any surplus being fed to the tank, which not only feeds the washers when the pump is not operating, but also gives fire protection to the whole plant. The pressure at the pump is 60 lbs.

The plant has a capacity of 1,500 to 2,000 tons of washed sand and gravel daily. With the track facilities available, this output, representing 40 to 50 cars, can be very expeditiously handled. Ample siding accommodation can take care of incoming and outgoing cars promptly. The plant is managed by Mr. W. E. Tummon, who has been in the stone business since 1911, always with the same firm, A. W. Robertson Ltd., formerly known as Quinlan & Robertson Ltd. The superintendent is Mr. U. Marcotte, who has to his credit 22 years of service with the company. The engineer in charge of the design and construction of the plant was Mr. E. S. Miles, who has had a wealth of experience in stone plant engineering.

Japan Exempts Building Materials from Duty

On account of the urgent necessity of re-building structures destroyed in the disastrous Japanese earthquake, the government of Japan, by Imperial ordinance, has exempted building materials and other articles necessary to livelihood from import duty until March 31, 1924. The list includes portland and other hydraulic cements, brick, clay tiles, plate or sheet glass, iron bars and rods, structural steel, iron plates and sheets (coated and uncoated), pipes and tubes of iron, nails, screws, rivets, rails and other materials for railway construction and materials for the construction of buildings, bridges, docks, etc., not otherwise provided for. In order to receive the benefit of free tariff, it is necessary that exporters take the usual proceedings upon arrival of the goods in port.

The Week's Developments in a Nutshell

Construction activity shows no signs of slowing up and it looks as if this activity would continue until stopped by severe winter weather. There is no unemployment and supply dealers report business keeping up almost to normal.

There is no dearth of money. We have just completed the absorption of two hundred million dollars, in a week, without any superhuman effort. This represents only about twenty-five dollars per capita as against the latest banking figures which show savings of one hundred and fifty dollars per capita.

It is encouraging to note that in the United States, where a collapse has been feared, the business outlook is now said to be very favorable. The National Bank of Commerce of New York, makes the statement that "At no previous period in the last five years has the general situation in the United States been as stable as today. Business continues active and there is confidence in the outlook. Except where special factors affecting supply and demand are operative, the general price level shows no indication of radical changes."

Price changes in Canada are negligible. In certain cases one hears of prices being shaded; for instance, in crushed stone where, as we noted in a recent issue, there has been an over-production. Paints also have eased somewhat. It is merely a seasonal condition, however.

Time Values as They Affect Construction Costs

A Tabulation of Actual Cases and a Suggestion of Their Bearing Upon the Problem of Building Proceedure—Construction Constitutes a Service to be Discriminately Selected

By MORTON C. TUTTLE
President, Morton C. Tuttle Co., Contractors, Boston, Mass.

Some one has defined perspective as that trick of vision which so frequently makes a cent near at hand obscure the more distant dollar:—a cynic's definition, but fairly true both to optics and to human nature. Everyone has his pet economy; everyone is, at times, penny wise and pound foolish; everyone is likely, unless constantly on his guard, to let apparent price overshadow considerations of actual cost.

The expensiveness of bargains most of us more readily admit in theory than observe in practice. Confronted with what appears to be a favorable fixed figure for the rendering of a promised service, we are prone to accept it without very exhaustive consideration of whether or not conditions may be involved which, before the contract is completely fulfilled, will entail expenditures far beyond those nominated in the bond.

Prices Fixed but Costs Variable

How this perfectly normal human tendency may operate in the construction field, and how it may result in transmitting low prices into high capital costs finds exemplification in a quite unexpected place.

There may be no question that a building contract undertaken in accordance with the specifications of experienced engineers places the contractor under the severest obligation possible to a fixed-price-fixed-requirement agreement. Where an owner insists upon that type of contract, there is, of course, no alternative; and, whatever the outcome, it must be viewed as the best obtainable within the limitations of the procedure employed. It is this consideration which gives point to the appended tabulation of the course of several contracts placed with various contractors, as they are recorded in the books of a distinguished firm of industrial engineers, to whose courtesy I am indebted for the data supplied.

A Proverbial Statement an Industrial Fact

Let me preface the tabulation with the single trite observation that, in industrial construction, time literally is money. A factory is not an end in itself. It is merely a means: merely one step in a progression whereby raw material is procured; is, by sundry conversions, increased in value, and is eventually distributed to the public in return for money sufficient to maintain the succession of processes so as to yield a profit.

Once, therefore, factory construction has been undertaken, every day of unnecessary delay in its completion spells actual money loss: on the one hand, loss of expected profit; on the other, loss through the accrual of overhead charges unbalanced by compensating income. Such losses should properly be reckoned as part of the capital expenditure in behalf of construction. The sum of them, plus the price paid to the contractor for his services, constitutes the real cost of the work.

The Burden Imposed by Loss of Time

The heavy burden of cost which the element of lost time may impose upon price is the startling feature of the following tabulation, taken, as I have already stated, from the records of actual performance. The figures of eight undertakings are given. They have not been selected as horrible examples; but have been lifted as a consecutive block from the engineers' records. They may, therefore, be accepted as representing unusually favorable, rather than exceptionally unfortunate, experience. Here, then, is the tabulation:—

A Tabulation from Actual Records of Construction, showing how, in building, time overruns may transmute apparently fixed prices into highly variable costs.

1	2	3	4	5	6	7
Contractor's Price	Agreed Time for Completion of Work	Contractor's Actual Time on the Work	Time Consumed Beyond Date Set for Completing Work	Percentage of Time Overrun	Estimated Money Loss to Owner on this Account	Cost of Work to Owner; ie, Price plus Loss
$530,000	8 mo.	12½ mo.	4½ mo.	56%	$58,685	$588,685
275,000	8 "	10½ "	2½ "	31%	16,877	291,877
140,000	5 "	6¾ "	1¾ "	35%	6,083	146,083
135,000	5 "	8¼ "	3¼ "	65%	10,673	145,673
135,000	5 "	5¾ "	¾ "	15%	2,566	137,566
608,000	11 "	14½ "	3½ "	32%	52,836	660,836
92,000	5 "	9 "	4 "	80%	8,959	100,959
140,000	5 "	6¼ "	1¼ "	25%	4,350	144,350
$2,055,000				42% Average		

The figures offered above have been so arranged as to show, in each instance, first, the price of the building, that is, the finally fixed payment to the contractor. There follows a notation of the time period within which the completed work was promised. Next is listed the item of performance; that is, of time actually consumed in construction. Since, without exception, there occurs a wide and unfavorable discrepancy between promise and performance, the next listing is devoted to that item, stated first, in terms of months, and, again, in terms of percentages. Next appears an estimate of the money loss involved in the time-overruns recorded. This estimate, added to the contractor's price, shows the real cost of each project.

The Tabulation Analyzed

An analysis of the first instance given in the tabulation will serve as a key to the analysis of the other seven. Keeping, for simplicity's sake, to major considerations, we may view the following as a conservative computation.

1. Contract price of building as awarded to contractor		$530,000
2. At the end of the agreed period (8 months) the expenditure will be approximately $465,000, which though idle, requires interest computation for the overrun period of 4½ months. Interest on $465,000, 4½ months at 6%	$10,462.50	
3. The balance $65,000 calls for computation of idleness for an average of 2¼ months. Interest on $65,000, 2¼ months at 6%	731.25	
4. Money will be tied up in land. More money will be tied up in machinery and factory equipment rendered unproductive for 4½ months by delay. Estimate land and machinery at $475,000. Interest on $475,000, 4½ months at 6%	10,687.50	

5. Failure to place the plant on a productive basis at the appointed time means failure to pay legitimate returns. The total estimated investment in land, building, machinery and equipment is here $1,090,500:

Contract price of building	$530,000
Land	30,000
Machinery and equipment	445,000
Installation of above ..	35,000
Engineer's Fee, 5% ..	50,500
	$1,090,500

It is proper to estimate return of 9% applicable to taxes, insurance, and various other carrying charges; the residue being available for other distribution.

Loss of income on $1,090,500, 4½ months at 9%	$36,804.57	
Total of losses enumerated above	$58,685.62	$58,685.62
Real cost of construction operation		$588,685.62

Additional Considerations

This analysis, as has been said, is illustrative rather than exhaustive. The experienced mill man would add to it many items totalling many dollars:—such items, for example, as

1. Storage charges on raw materials purchased for manufacture.
2. Interest on money invested in such materials.
3. Losses due to inability to carry out sales campaign programs.
4. Losses due to inability to meet seasonal opportunities.
5. Loss of trade opportunities, of prestige and of goodwill.
6. Cost of maintaining special personnel engaged to man the plant.

The list might be continued indefinitely. It is, of course, unnecessary to point out the fact that what is here true of industrial construction is quite as true of that type of construction which includes hotels, apartments, stores and other buildings where the owner's income is derived directly from rentals. Indeed, the principle involved is of universal application.

Old Custom Giving Place to New

Such, then, are the frequent facts of construction. Price, the consideration which governs the placing of many contracts, is evidently something far different from cost. And cost, again, is evidently very largely determined by the contractor's fidelity to his promises of performance within a given time. That such fidelity is liable to repeated lapses, the figures make quite too clear. And, to all appearances, the party to the enterprise who suffers most is the owner of the building.

If there is any lesson to be drawn from this, it would appear to be that, under modern industrial and economic conditions, a large and complicated construction enterprise involving many unpredictable factors is not capable of satisfactory protection under the old time form of fixed-price contract. It is becoming increasingly important that complete control of various elements—notably that of time—affecting any important building operation should remain in the hands of the owner and his engineers.

Probably that accounts for the observable change of viewpoint whereby the idea that a projected building is a commodity to be bought is being superseded by the realization that consideration constitutes a service to be discriminately selected. This is the viewpoint in accordance with which certain great financial powers are regularly proceeding. Their need for construction they meet by the employment of highly competent and well equipped professional agents, all of whose energies are directed to meeting the client's requirements, while at the same time, safeguarding his interests. The basis is virtually the same as that used in the employment of professional service in any other field. It may be assumed that the results are quite satisfactory.

Financing the Small Home

A Brief Treatise that Shows the Various Methods of Paying for a House

"Financing the Small Home" is the title of the latest chapter issued by the National Lumber Manufacturers Association in its series on "Lumber and Its Utilization," in connection with the national movement for more homes and better homes.

"The man who owns and loves his home," says the preface, "can usually be depended upon to practice the virtues of citizenship. In spite of the fact that more than one-half the urban population of the United States are tenants, the automobile is moving the down-town population year by year to the suburbs. The demand of the man who can afford to spend $25,000 or more for a home is being met. There is need to give the man who has good taste and small means a chance to own his home. Individual opportunity to acquire a home must not be denied to any person who is willing to work and save to that end."

With the simplicity, definiteness and conciseness that characterizes all the chapters in this series the problem of financing the small home is dealt with in a most conclusive manner. Comparing the family as tenant or home owner it is pointed out that eighteen years' rent of a $5,000 cottage at $50 a month, plus interest on the rental sum calculated at 6% for an average of nine years, would total $16,632. On the other hand, with a cash payment of $500 and amortization payments extending over eighteen years, the total cost of purchasing the cottage would be $13,024, including eighteen years' interest on an average of $4,860, interest on interest payments and on the original cash payment.

The three general methods of home financing, namely, (1) membership in a building and loan association, (2) borrowing on first and second mortgages, and (3) paying on contract for deed, are described and discussed at length. This discussion is so clear that the prospective home builder, after reading it, has very definite conclusions as to how to proceed to finance his home. As to the cost of the home, the rule is laid down that it should not be more than one-and-one-half to two-and-one-half times the owner's annual income; and the total sum should be paid in ten to fifteen years. Detailed instructions are given as to how each person may calculate for himself how much he can afford to spend in purchasing a home.

On the subject of present costs of dwelling houses it is pointed out that the increased cost in recent years is very largely the higher cost of better construction and more elaborate equipment. People used to build houses that included only the necessaries of shelter; now they insist on luxuries and adornments. For example, 95 per cent. of bath-rooms must now have tile floors and expensive fixtures. Every house owner insists on having an instantaneous water heater, adding about $200 to the total cost of the building. There are many other items which add greatly to the cost of an acceptable house in these times. Nevertheless a lumber-built house is claimed to cost considerably less than it did in 1920.

The prospective builder is advised to check his building costs carefully in advance and to figure the distribution of his outlay among the chief divisions thereof. The lot should cost approximately 20%; labor not more than 31%; materials 29%; contractor's overhead and profit 12%; financing cost 2%; plan service, real estate fees, etc., 6%.

The discussion of building and loan associations will be a surprise to many persons. These associations have now financed more than 1,000,000 homes. There are 10,009 of them in the country, with a membership of 6,864,144, and with assets in excess of $3,300,000,000. A study of their records for the past 92 years justifies the belief that no man of ordinary health, ability and purpose need long deprive his family of the benefits of home ownership.

Full consideration is given to other ways of placing loans, such as savings banks, co-operative banks, financing with bonds, straight mortgage loans and the contract-for-deed method. It is pointed out that the material ought not to be expected to finance home-building, as is often the expectation. He should be able to devote his energies to seeing that the builder gets sound construction for his money, that the quality of small houses is improved through better planning and designing and that with every house built to sell there goes an abstract of construction showing the kind of materials of which it is built. Notation is made of the sources from which the information used in preparing the pamphlet, has been drawn, which will be very helpful to those who desire further to pursue the study of home-financing.

Building Permits Report for August

Reports from 56 cities tabulated by the Dominion Bureau of Statistics show that the value of the building permits issued decreased during August, when the estimated cost of building work declined to $12,541,593 from $13,544,137 in July. There was, therefore, a reduction of $1,002,544 or 8 per cent. In comparison with the figures for August, 1922, there was a larger falling off in prospective building, as the total for the 56 cities in August, 1922, was $17,946,228. The difference ($6,404,635) represented a decrease of 35.7 per cent, which reflected to a considerable extent reaction from the exceptionally high level for that month due to the granting of a permit for a drydock in Vancouver.

Forty-nine cities made detailed statements showing that they had issued slightly over 1,300 permits for dwellings at an approximate valuation of $5,480,000 and for some 2,800 other buildings estimated to cost $3,960,000. In addition authority was granted for the erection of a grain elevator in Vancouver at a proposed cost of $1,200,000.

Quebec and British Columbia recorded increases in the value of the building permits issued as compared with the preceding month; there were gains of 2.5 and 144.4 per cent, respectively, in those districts. Of the reductions in prospective building elsewhere those of $359,142 or 92.2 per cent in New Brunswick and of $229,358 or 50.5 per cent in Alberta were the largest percentage decreases, but the actual loss of $1,506,304 or 21.8 per cent in Ontario was most extensive.

All provinces recorded less anticipated building than in August of last year. The decrease of $3,486,971 or 57.2 per cent in British Columbia and of $1,385,335 or 20.4 per cent in Ontario were especially marked. As mentioned above, the large decrease in the former province was a falling off from the unusually high total recorded in August, 1922, on account of the granting of a permit for a drydock in Vancouver.

Montreal and Vancouver reported larger totals of prospective building than in July, but reductions as compared with August of last year. Toronto and Winnipeg showed decreases in both comparisons. Of the smaller centres, Westmount, Stratford, Sault Ste. Marie, Windsor and Victoria recorded increases in the value of the building permits as compared with July and also with August of last year.

The value of the building permits issued from the beginning of this year to the close of August showed a decline as compared with the same period of last year. There was, however, an increase over the first eight months of 1921.

Construction Developments During the Month of September

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, September, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	4	$ 132,000	2	$ 375,000	....	$...........	....	$...........	6	$ 507,000
Churches	10	203,500	2	36,000	1	4,000	2	41,000	15	284,500
Factories	10	295,500	8	276,000	....	....	....	....	18	571,500
Public Garages	11	106,500	5	51,200	....	....	....	....	16	157,700
Hospitals	6	206,500	1	137,500	1	70,000	....	....	11	414,000
Hotels and Clubs	5	120,000	2	94,000	....	....	1	3,000	8	217,000
Office Buildings	10	109,000	4	190,000	....	....	1	20,000	16	621,800
Public Buildings	6	286,700	6	100,300	....	....	3	17,100	16	414,100
Residences	1093	1,856,900	331	1,681,700	1	19,800	12	76,400	1444	6,662,300
Schools	21	717,100	6	61,500	1	125,000	1	350,000	30	1,257,900
Stores	30	312,500	15	150,500	1	1,000	....	....	46	167,000
Theatres	1	4,500	1	7,000	....	....	....	....	2	11,500
Warehouses	6	196,000	1	5,000	1	1,800	2	9,000	10	211,800
Total Buildings	1213	$7,847,000	387	$3,165,700	9	$224,600	22	$516,500	1638	$11,798,100
Bridges	12	829,900	9	69,800	1	2,000	....	....	22	901,700
Dams and Wharves	4	53,100	8	297,900	1	5,000	3	23,300	17	387,100
Sewers & Watermains	18	279,300	3	255,600	1	7,000	1	10,000	23	551,900
Roads and Streets	73	1,782,400	28	1,313,600	5	50,000	5	50,000	111	3,196,000
General Engineering	17	1,194,900	5	1,630,400	2	106,500	5	171,700	34	3,153,500
Grand Total	1337	$11,986,600	440	$6,733,000	19	$395,100	36	$771,500	1845	$19,988,300

Construction Contracts Awarded in Western Canada, September, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Churches	2	$ 7,300	2	$ 19,000	1	$ 5,000	2	$ 15,000	7	$ 46,300
Factories	1	100,000	1	10,000	....	....	3	135,200	5	245,200
Public Garages	1	8,000	2	2,000	3	4,500	2	6,800	8	21,300
Hospitals	....	....	1	62,800	1	16,500	2	6,600	4	85,900
Hotels and Clubs	4	53,400	1	4,000	1	9,500	1	20,000	7	86,900
Office Buildings	4	34,900	....	....	1	2,000	1	21,000	6	57,900
Public Buildings	5	238,500	3	38,700	2	12,400	5	146,100	15	435,700
Residences	84	338,400	31	94,600	30	113,600	92	375,400	240	922,000
Schools	3	98,300	3	61,500	15	179,200	1	1,100	22	340,100
Stores	12	45,800	5	94,500	4	6,500	6	24,500	27	171,300
Theatres	....	....	1	15,000	....	....	....	....	1	15,000
Warehouses	....	....	1	16,000	1	16,000	2	24,500	4	56,500
Total Buildings	116	$ 924,600	54	$ 418,100	59	$365,200	117	$776,200	346	$2,481,100
Bridges	....	....	....	....	....	....	3	14,500	3	14,500
Dams & Wharves	4	85,000	....	....	....	....	....	....	4	85,000
Sewers & Watermains	2	4,900	1	22,000	1	14,000	2	68,800	6	109,700
Roads and Streets	20	249,000	1	62,400	12	116,400	12	137,700	45	565,500
General Engineering	1	35,000	1	100,000	....	....	....	....	2	135,000
Grand Total	143	$1,298,500	57	$602,500	72	$495,600	134	$997,200	406	$3,393,800

For the Building Supply Dealer

Winter Need Not Halt Supply Business

A Chance for the Dealer to Push the Winter Construction Idea—A Movement that Will Mean Increased Business

The Contract Record has constantly advocated in editorials and articles the winter construction of buildings. Experience has already demonstrated that it is quite possible to carry on most classes of construction in spite of low temperatures, and the practice is growing, we believe, of keeping as many operations under way as possible. Building in the cold months is practicable in every respect and the available devices for carrying on even exterior work make it possible to ignore unfavorable weather conditions and speed up activities so as to lessen the congestion generally noticeable in the spring and summer seasons.

For the building supply dealer the continuation of building through the winter has an important significance. It means that the dealer can keep his organization in active operation straight through the season instead of having it suffer stagnation as is the case when the active selling season closes in the fall. Winter building creates the opportunity for increased business—a point that all building supply dealers will feel a sympathetic interest in. "Building Supply News" is taking up the question and in a recent issue prints the following article by W. E. Hart, manager of the Structural Bureau of the Portland Cement Association.

To the building supply man the ominous approach of cold weather has been wont to bode ill tidings. The seasonal construction policy, in vogue by custom rather than necessity, has caused seasonal business fluctuations with which he has annually to contend. The maximum demands during the peak of summer construction has taxed his ability to maintain adequate stocks and to supply his customers promptly. These are "indications of good business," one may avow—so "good," in fact, that often he was not able to keep up with the demand!

Avoid the Spring Traffic Jam by More Winter Building

But if we for a moment carefully consider this period of "good business" we must arrive at the conclusion that the short seasonal over-demand may be only a bad case of seasonal trade congestion, analagous to a traffic jam on a thoroughfare whose capacity is inadequate during the short rush hour. Busy street?—no—traffic congestion!

If the interests associated in the building industry would co-ordinate their efforts toward the establishment of a full time (all year) construction program instead of submitting to the fanatical seasonal policy, now so widely in operation, much benefit would be derived as a result—a gain to the public at large and to the builders and material dealers in particular.

The lagging demand accompanying the cessation of summer activity requires, however, that a semblance of adequate quantities of aggregates and building materials and supplies of all kinds be maintained. Here the dealer again experiences the possibility of overstock with its attendant increase in overhead due to decreased sales, spoilage and loss of interest on investment of plant, equipment and stock.

Kinds of Building Activity That Are O. K. in Cold Weather

That the ill advised annual "shut-down" of building operations is a fallacy is evident from the ever increasing amount of winter construction successfully carried on in all the larger cities throughout the northern regions of the country.

It is well established that excavations, in general, can be made with greater facility and economy in the fall, due to the dry, stable condition of the soil, as compared with the water-logged, spongy earth encountered during and after the spring thaws.

Concrete work can be done in winter with absolute safety. A few simple precautions exercised during and after placing the concrete to prevent lowering of temperature and the consequent retardation of the chemical action in the hardening process will insure perfect results.

Brick, plaster and similar work can be handled in like manner.

Labor Benefits of Winter Construction Program

Aside from the fact of the feasibility of winter construction operations themselves, is the consideration of the benefits to be derived from the plentiful supply of labor, both skilled and unskilled. Both may be had in quantity, without the adoption of the usual policy of premium rates and without being delayed on the job due to time lost in the recruiting of tradesmen for the various types of work or being obliged to wait on sub-contractors who find themselves in a similar position during the summer construction period.

Each spring, builders and real estate dealers are deluged with the rush of prospects for homes and apartments. The expiration of leases added to the natural desire of home ownership, hastened by the advent of spring weather, combine to produce this annual condition. The sellers find themselves with an inadequate supply of buildings to satisfy the demand—and often with no new buildings at all, or with a few foundations left from the previous fall, and which have weathered the winter more or less successfully. Homeseekers cannot be sold on a "hole in the ground" and the great majority no longer look with favor upon a set of meaningless blueprints attached to a promise to build and "have ready for occupancy by May 1."

Building "Pandemonium Peak" Can be Abolished by Winter Construction

If the gospel of the practicability of winter construction could be carried to builders, real estate dealers and individuals contemplating construction, the leveling of the peak of our yearly building pandemonium would be accomplished and the building industry placed on a sound all-year basis.

The dealer is in a position to aid materially in this direction. His contact with the organizations engaged in the business of building is his big opportunity and likewise his growing assurance of a stable market for his materials and that more and more he will be convinced that his is a legitimate business instead of a "game of chance."

By his ability to offer adequate supplies with perfect service, the dealer will remove the scare of delay from the builder's mind and create confidence among his customers.

If the material item can be made as attractive to the builder as his winter labor supply there should be no hesitancy for him to proceed with his plans and, jointly, all will reap the benefits by the adoption of a sane program of winter construction.

Business Obtained Only by Going Out and Getting It

A building supply dealer in Toronto speaking to the Contract Record said that the only way to obtain business is to go out and get it. "Business—that is, big business—will not come into the office of its own accord," he stated. "You must go out and dig it up. This is why we have two salesmen on our staff—two men who are constantly on the road, so to speak, selling our services to contractors or other purchasers of building supplies. Of course, we have a large number of long established customers who do not need to be sold. They come to us always when they have an order to place. In the years that they have been dealing with us they have found out for themselves just what service we have to offer and so satisfied are they that they keep placing their business with us. Customers of that type we are especially glad to have because their continued patronage assures us that we are living up to what is expected of us.

"Aside, however, from the business that long established connections have brought us," continued the dealer, and here he disgressed for a moment to emphasize the value of establising and maintaining profitable business connections, "a great proportion of our orders must necessarily come as a result of constant sales efforts. New contractors are always entering the field, or out-of-town firms receive contracts and establish a branch here and these must be sold, but even old established firms require our attention, for many of them are not in the habit of purchasing from any particular dealer, and if the business is not to go into the hands of our competitors we must be right on the job.

"Sometimes, of course, our competitors do get the business in spite of our efforts but we do not begrudge it to them," he stated. This seemed to express his attitude toward other firms in the same line of business—no hard feelings or bitter antagonism, but rather a harmonious and well-disposed relationship. "There is enough business for all of us," was his claim, "and while we often regret that some good orders do not come our way we know that all of us in the building supply line are entitled to some share of the business that is available."

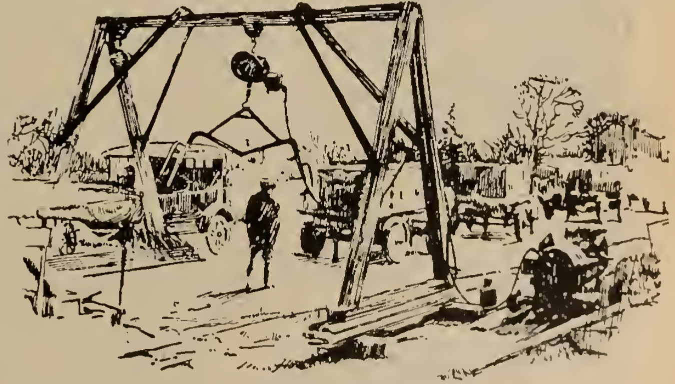
Hints for the Contractor

Light Gantry Transfers Batch Boxes

Construction of a 101½-mile concrete road in North Carolina, known as State Aid Project No. 533, involved some rather unusual difficulties due to the fact that the only available materials shipping point was one mile from the end of the road. This necessitated unloading of all concrete materials at a siding near where the job began and hauling preproportioned batches in steel boxes on motor trucks and trailers over as much of the concrete road as was opened to traffic and then transferring the batch boxes to industrial cars for transportation past the new pavement to the mixer.

In order to avoid turning the trailer around, the truck-trailer unit ordinarily continued past the aggregate bins and drew up at the cement shed, where four bags of cement were placed in each batch box on the truck. The truck was then uncoupled from the trailer and driven to the aggregate bins, where stone and sand were added. Meanwhile cement had been placed in the batch boxes carried by the trailer. The truck then backed up to the cement house, and was coupled to the other end of the trailer, which was then pulled up to receive the aggregates.

With paved streets and the concrete road to haul over, the trucks made good time en route to the transfer station where they stopped under a light gantry crane which carried a pneumatic hoist. The gantry spanned the concrete slab and the track of 24-in. gage along the shoulder. Lifting tongs suspended from the hoist were hooked into holes at the sides of the batch boxes, and they were quickly lifted and moved sidewise to position over an industrial car track. When enough boxes had been transferred to make up a train load, the cars were pulled to the mixer by a gasoline locomotive.


Gantry moves batch boxes from truck to train

According to a recent issue of Concrete Highway Magazine, eight cars, each carrying two boxes, was a standard train, though on grades, of which there were several ranging from 3 to 5 per cent., the train length was cut as low as five cars.

The work was done by the Royer-Ferguson Co., Inc., of Roanoke, Va. John D. Waldrop, of Greensboro, N. C., was district engineer in charge of the work for the state.

Things Sometimes Overlooked on Compressors

The following extract is from the letter of an engineer in a foreign field, and is suggestively interesting because it reveals just what can happen when all the parts of a machine are supposedly adjusted or assembled in proper order. It appeared in "Compressed Air Magazine."

"I recently visited a big construction job where a number of compressors were supplying air for rock drills. One of the compressors was running quite nicely, but it was plain that the unloader was not correctly adjusted. Wishing to see what the difficulty was I ran the pressure up, expecting the safety valve to blow at 100 pounds. But the pressure mounted to 110 pounds without giving any signs of blowing, so I unloaded the machine and proceeded to search for the reason why.

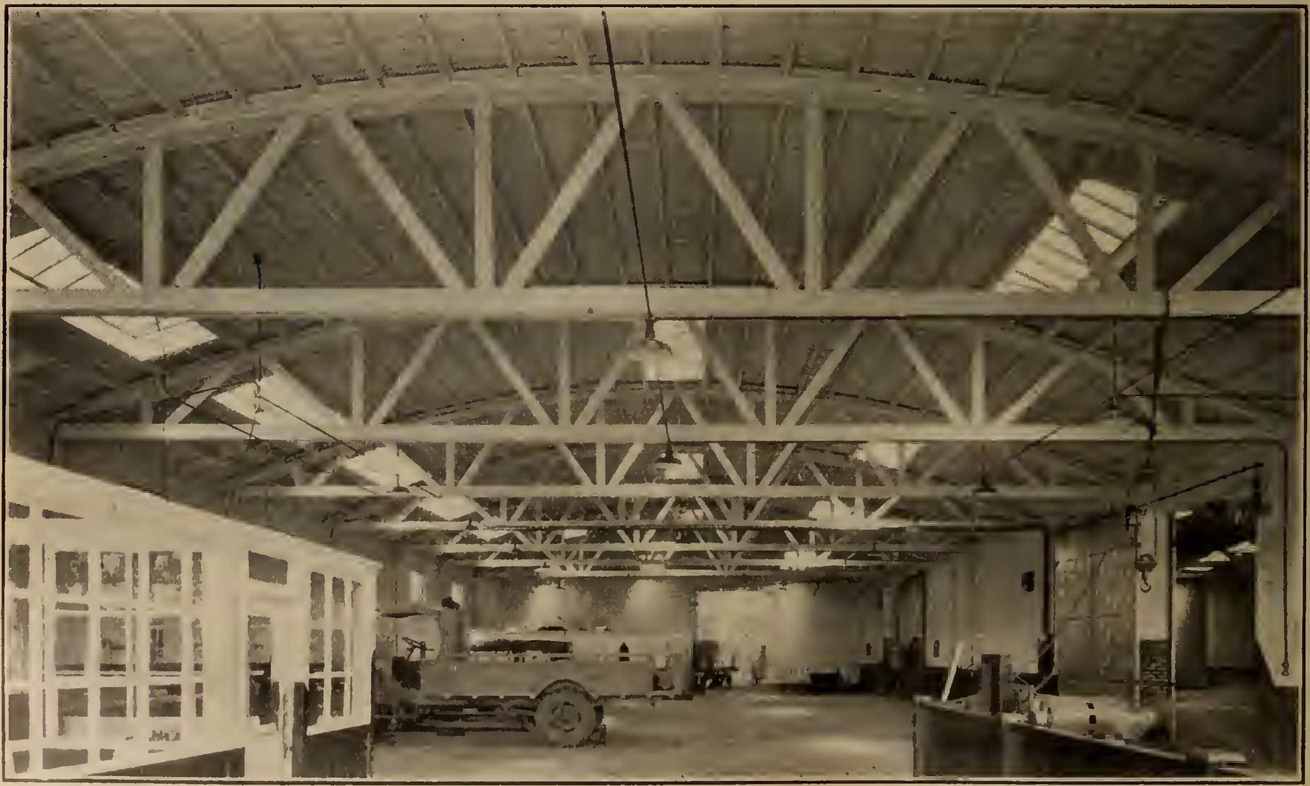
"The safety valve was of the weighted lever type, and was set for 100 pounds; so I eased the weight, but without results. Even when I took off the weight its removal had no effect. Accordingly, I concluded that I was confronted with a stuck valve, and I rattled the valve stem without achieving anything. By pushing the lever right up I eventually got the valve to blow and then, to my mortification, and not until then, did I discover that the valve was on back to front so that the pressure, instead of opening the valve, tended to close it tightly.

"I may say that this machine had been operating to everybody's entire satisfaction for about three weeks in spite of the condition of the valve; and, as the man in charge might never have thought to test his safety valve, things might have gone on unchanged until the compressor went to smash and, possibly, made an equally sudden end of its attendant."

The moral to the foregoing story is: Read carefully the book of instructions furnished by the compressor manufacturer. The following quotation is pertinent: "See that the safety valve is in working order, and test it occasionally by lifting the lever or raising the pressure to the blowing-off point."

New Type of Roof Truss

A new type of roof truss is being brought to the attention of contractors throughout Canada by the patentee, Wm. J. Summerbell, 1021 Mission Road, Los Angeles, Cal. The truss is known as the Summerbell roof truss and is said to incorporate in its design several meritorious features. In addition to the initial saving in price, the saving in several courses of brick is obtained, less roof sheathing and fewer squares of roofing are required and in addition, by the elimination of all sharp angles, the roofing is claimed to last longer. Summerbell roof trusses are proving serviceable in garages, factories, warehouses, theatres, gymnasiums, etc. The trusses are built on the site of the job, from material obtained locally and may be manufactured in advance, so as to be ready when the walls are up.



Summerbell Roof Trusses in a large garage

Resourceful Method of Recapping Gas Well

Steel-jacketed Bullets Used to Remove Broken Valve—Flame Extinguished by Means of an Old Smokestack

To be called upon to control and recap a gas well "running wild" and spouting a sheet of flame 75 feet in the air and to do this by shooting off the broken valve by means of steel-jacketed bullets from a rifle was the recent experience of Dominion Government engineers in the course of their unending campaign to prevent a wastage of natural resources, no matter where located and regardless of the difficulties involved. While the regulations governing oil and natural gas development explicitly state that all mishaps on leases must be corrected by the operator, it has happened that through the failing of valves and cappings or the tampering with fittings and equipment by ignorant or maliciously disposed persons, wells have become a menace to the field and wasters of gas or oil.

The case referred to above, and which may be cited as a typical example of the resourcefulness and determination of those who did the work, was that of a natural gas well at Pelican Rapids, on the Athabaska river about 165 miles north of Edmonton, Alberta. During March, 1922, it was reported that the capping of this well had, for some unknown reason, failed and that the resulting flow of gas had become ignited. When the fact that this well was on fire was reported to the North West Territories and Yukon Branch of the Department of the Interior, which is charged with the administration of the law with respect to oil and gas operations and the preventing of waste therein, the branch immediately sent its petroleum engineer to investigate and to recap the well as soon as possible.

Fighting Intense Heat

Upon reaching the ground it was found that the opening through which the gas was escaping produced a flame of a peculiar shape with one end beating upon the ground close to the casing. The intensity of the heat generated was so great that the pipe and fittings were heated to incandescence and it was clear that nothing could be done until the fire was extinguished. This had to be done with what equipment could be improvised on the ground, far away from machine shops or other aids.

The first step in the operation was to change the shape of the flame so as to make it possible for men to work in closer proximity to the casing. This could only be done by cutting the casing below the control valve and allowing the gas to be discharged upwards and the flame to take the shape of that of an ordinary candle.

A Lee-Enfield rifle was employed to cut the casing and this was set up on a tripod at a distance of twenty-five yards from the target. Steel-jacketed bullets were used, and during the firing of the first twenty-five rounds the especially dangerous features of the work were encountered. Jets of burning gas, necessarily lined directly back on the rifle, were forced through the new openings caused by the rifle fire. The noise of the gas, under pressure of over two hundred pounds to the square inch, escaping through the bullet holes, was so great that cotton wool had to be placed in the ears of the workers to protect their ear drums. However as the number of rounds fired increased and with it the size of the opening, the more spectacular and dangerous features of the operation gradually disappeared and after about two hundred rounds had been used the valve separated from the casing and the flame rose like a torch to a height of seventy-five feet.

Extinguishing the Flame

The next problem was to extinguish the flame. Roughly outlined the scheme was to drop one end of an iron smokestack about thirty feet long, found on the ground and which had been used in the original drilling operations, over the casing, then to incline it slowly until the base of the flame was carried as far as possible to one side when, by unshipping the bottom of the stack, it was hoped to create a gap between the top of the casing and the base of the flame long enough to prevent re-ignition. As a boom derrick could not be used, a steel aerial cable was run from an old drilling derrick to a tree to which was rigged a trolley controlled by guide wires. The old stack was then suspended from the trolley and run in opposite the flame and the lower end drawn by guide wires until it was directly over and about one foot above the casing. The consequent draft caused the gas to flow into the stack and burn from the top. After this had continued for sufficient time to get the casing cool the lines holding the bottom were released, thus cutting off the gas supply at its head and extinguishing the flame. This was an anxious moment but the operation was successful and the big flame at the top of the smokestack died out without igniting the gas pouring out of the casing. It now only remained to recut the top of the casing with cold chisels and attach a new control valve. The work was then completed and the well left in such shape as to be safe and at the same time ready to be again operated when the necessity arose.

Fundamentals of Road Construction

Basic Principles that Should Govern the Financing, Design, Building and Maintenance

By T. J. WASSER

Fundamental principles are those which can be applied to the financing, design, construction, maintenance and use of the highways similarly in each and every province or state. The following are what I call fundamental principles.

Financing Highways

It is the duty of the governing body charged with the financing of highways to provide funds for construction either by bond issue or direct tax, using funds derived from the licensing of vehicles and drivers for maintenance only.

Design and Construction of Highways

The design and construction of the highway must first provide for a graded roadway properly and sufficiently drained and of a minimum width of thirty feet. Such a roadway should be free from sharp curves, steep grades, and all obstructions, including ditches, rocks, poles, fences, signs, drainage head walls, narrow bridges, trees, shrubbery, gas filling stations, etc.

The design and construction of the paved surface must be of such as to meet the demand of regulated modern traffic. It must be of sufficient width to permit two vehicles of a size within the legal limits to pass each other at the legal rate of speed with safe clearance, and without danger of collision. In cases where such a width is not justified, it is recommended that half width pavement be constructed with one edge on the ultimate center line rather than centering a narrow pavement on the graded way. Such an arrangement will best adapt itself to future widening, and in the meantime permits of the maintenance of an adjacent earth road. Local conditions will govern in the selection of the side to be paved, but as a rule it should be on the right hand side going towards market.

It must be of a type of construction to permit carrying vehicles loaded within the specified legal limit, without injury to the pavement.

The construction of the highway depends upon the faithful performance, trained knowledge and ability of those engaged to carry out the provisions of the design.

Maintenance

The maintenance, in addition to upkeep, should provide for keeping the highway open for traffic, free and clear of all obstructions at all seasons of the year. Particular reference is made here to the care that is necessary to keep the shoulders adjoining the paved surface from being worn away. Excessive work on keeping up the shoulders flush with the pavement is due to insufficient width of paved surface, and should be charged to faulty design. The minimum width of the paved surface of a highway should be classed as a fundamental principle.

Maintenance should be of the highest order in place of permitting the road to go to pieces for lack of attention to the drainage system and the ordinary wear and tear on the surface. Maintenance does not mean the restoration of a road that was faultily constructed or a well constructed road that was injured by overloaded vehicles.

If the principles set out are followed, then the highway is ready for use. If not, then I firmly believe the highway has been abused before it has been subjected to use.

Tenders Wanted on Railway Construction in New Zealand

Copies and plans and specifications for the construction of 18 miles 18 chains of railway on the East Coast Main Trunk Railway have been received and may be inspected at the office of the Director, Commercial Service Ottawa. The contract includes the following works:—

Felling, clearing and grubbing; construction of all the earthworks, ditches, cuttings and embankments to form a line of railway and sidings with the curves and gradients on the plans and sections; constructing the bridges, culverts, drains, pipes, boxes and other water passages, stream and road diversions ,and alterations; constructing all overbridges and subways; constructing the station buildings, cottages, goods-shed, loading-banks, water tanks and all other station-yard structures; constructing the fencing; constructing all earthworks, and metalling of road and private crossings and approach roads to station-yards; trimming the formation previous to plate-laying, laying permanent-way in main line and sidings; ballasting line; and other works detailed in the specifications.

Tenders close on March 18, 1924, and they should be addressed to the Secretary, Public Works Tenders Board, Wellington. Two thousand pounds must be deposited with the tender and £10,000 must be deposited as a bond.

Soliciting tenders for railway construction is a new departure on the part of the New Zealand Government; such work has heretofore been undertaken by the Department of Public Works, and subsequently handed over to the Railway Department.

Three-Sack Mixer Favored for Paving

By a vote or 2 to 1, the 13-E, or 3-sack paving machine has been designated by paving companies of the Associated General Contractors as the proper size of a middle-sized paver.

On account of a difference of opinion among manufacturers, expressed at the meeting of the Joint Committee on Construction Equipment, in Chicago, July 30, they referred this matter to the Associated General Contractors for determination by referendum to members interested in paving work. Certain manufacturers favored the 12-E, or 2-sack machine, while certain others favored the 3-sack type.

The opinion of paving companies concerning this matter is indicated by the replies received to the following questions:

(1) Exclusive of type consideration, which size of power is preferable for work requiring a medium-sized machine?

Result: 94 in favor of the 3-sack and 49 in favor of the 2-sack.

(2) If the 3-sack machine sells at a price of $1,500, or less, above the 2-bag, would the price be the determining factor to any great number of construction companies?

Result: 49 yes and 93 no.

(3) If the 3-sack machine is, in your judgment, more suitable, should the advantage of capacity be sacrificed to the production of a machine at a relatively lower price?

Result: 49 yes and 96 no.

(4) Is it advisable to have a paver between the 7-E and 21-E?

Result: 94 yes and 49 no.

Reasons assigned for voting in favor of the 3-sack machines are as follows:

"As the paver in question would be used on city streets, car lines, alleys, and other limited paving jobs where material would be handled almost entirely by hand, we believe that the 3-sack mixer would be preferred by the majority of road and street contractors. It would also be the most practical size for retaining walls, culverts, small bridges usually found in connection with road and street work. The question of price we believe in the past has been too large a factor and if the equipment manufacturers will concentrate on a limited number of sizes, high quality, one hundred per cent service, and sell the machine best required to perform the work which the contractor has to do, the question of price will take care of itself."—Samuel Gamble Company.

"The specifications of a number of highway departments now provide that no mixer of less than 3-bag capacity can be used in the laying of concrete surface.

"It is our opinion that the 3-bag paver will meet the requirements for a small-sized unit on city streets cut by car lines, alleys, etc., and ,at the same time, give the contractor a unit of greater changeability and marketability than the 2-sack paver. This is due to the fact that it will also be suitable for use on highway paving work in emergency or under particular circumstances which might make a temporary use for such purposes desirable."—Winston & Co.

"We like the large paver because it is not likely to be overcrowded as much as the smaller one. The vital parts will stand up better under the requirements. This condition does not, however, develop while the machines are new."—Bent Brothers.

Machinery & Equipment

Koehring Company Announces New Balanced Valve

A new three-way balanced valve, the culmination of years of study and experimentation, has been perfected by the Koehring Company of Canada, Ltd., Toronto, Ont., and is now installed as standard equipment on Koehring 21E pavers.

Work on this new valve was begun in 1915 to overcome the difficulties of the old three-way valve with a metal to metal seat which never was wholly satisfactory due to unavoidable leakage when the water contractors are forced to use contained hard substances which cut the metal contacts. This new valve completely eliminates this trouble as there are no metal to metal seats. All of the valve parts which come in contact with water are made of either bronze, brass, rubber or leather, preventing corrosion. It is balanced, automatically operated, permanent, non-freezing, self-draining and completely accessible.

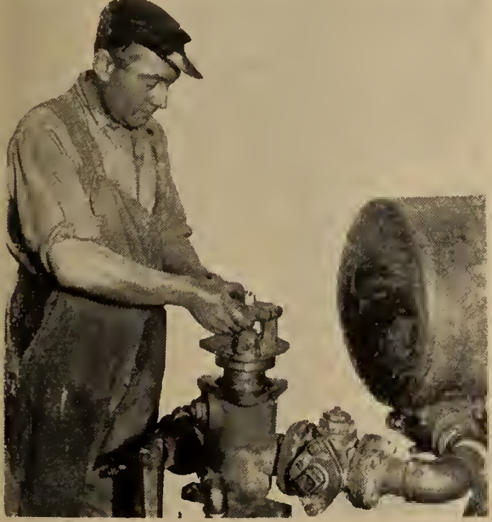


Fig.1—Valve may be easily inspected, taken down and re-assembled

The rubber valve discs and the leather plunger, which receive the hardest usage, were removed from some valves that had been in service for several seasons. They were still in good condition and were continued in service. These rubber discs and leather plunger are standard Jenkins parts carried in any hardware store.

Inspection of the valve can be made very easily. By merely removing three bolts and one pin connection the entire unit can be pulled out of the valve body. The valve can be dropped back into place without any fitting or adjusting. To turn the three bolts down and make the pin connection to the operating levers is only a few minutes' work. A removable housing protects the valve and outside valve parts from stone, sand and cement which may drop from the charging skip.

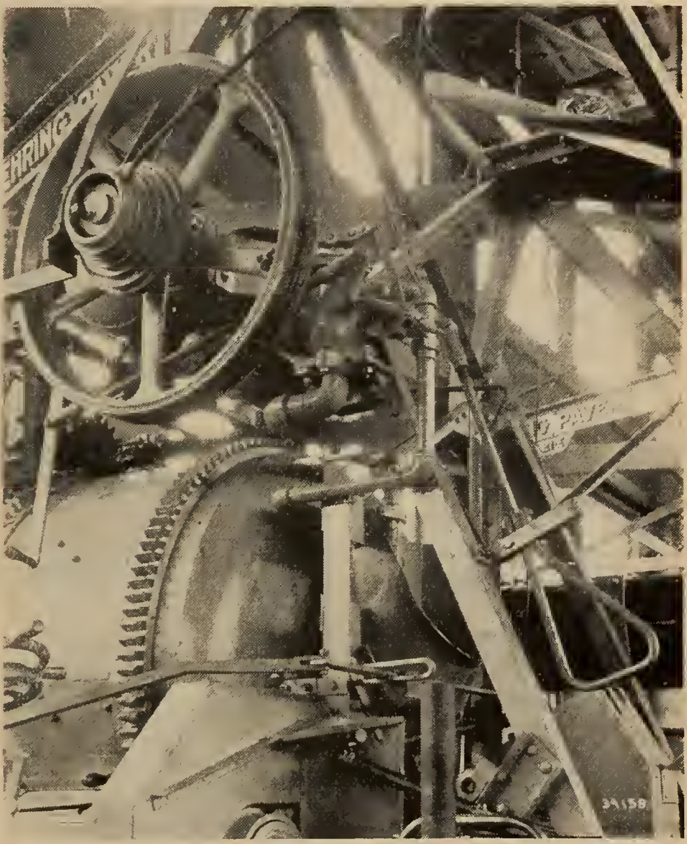


Fig. 2—Showing the valve installed on a paver

An additional time-saving feature is the automatic opening of the valve to discharge water into the drum. Fig. 2 shows the valve installed on a paver and the arm which opens the valve when the skip is raised. The time of opening the valve is adjustable in the valve operating mechanism. A hand control is also provided for operating the valve. The valve is balanced because the pressures are equal, which permits easy operation.

For two years this type of valve has been installed on Koehring pavers in the field, functioning under the usual severe conditions under which a valve must operate. These valves were then returned to the factory from time to time for inspection and improvement. The valve now announced is the result of these years of expert designing, experimentation and test and is the last word in a paver three-way valve design.

For the Contractor Who Builds Asphaltic Concrete Pavements

What is Considered to be Good Practice in the Laying of Asphaltic Concrete—Its Use for Base Courses—Practical Construction Pointers

By C. P. JENSEN*

The term "asphaltic concrete" is a very much abused name. In the lay mind, and even in the minds of many paving engineers, the term "asphaltic concrete" has been unfortunately used to include sheet asphalt mixtures, composed of sand and asphalt only; Topeka mixtures, virtually sheet asphalt mixtures with the addition of 10% of not to exceed half inch stone chips; and even to include oiled macadam pavements, made by the penetration method.

As represented by the best construction methods of the present day, the term "asphaltic concrete" should be restricted to a pavement employing a well proportioned mineral aggregate of approximately 2½ inches maximum size, mixed with the proper proportion of asphalt in a properly designed mixing plant, and laid under compression, with a resulting specific gravity of 2.40, corresponding to a weight of 150 lbs. per cubic foot.

I quote as follows; from the Fresno county specifications controlling the manufacture and laying of the base course.

Base Course

(a) **Composition:** The base course shall be composed of crushed stone, gravel or crushed gravel, sand, stone dust or lime dust, and asphaltic cement, in the following proportions by weight:

Passing a screen having 2½ inch round openings, and retained on a screen 1½ inch round openings	35% to 45%
Passing a screen having 1½ inch round openings, and retained on a screen having ¾ inch round openings	15% to 25%
Passing a screen having ¾ inch round openings, and retained on a screen having 10 meshes to the inch	10% to 20%
Passing a screen having 10 meshes to the inch	20% to 30%
Asphaltic cement	4% to 9%

Materials passing the 10-mesh screen, shall conform to the following proportions by weight:

Sand, passing a 200-mesh screen	5% to 10%
Sand, passing an 80-mesh screen, and retained on a 200-mesh screen	20% to 33%
Sand ,passing a 40-mesh screen, and retained on a 10-mesh screen	3% to 45%
Sand, passing a 10-mesh screen, and retained on a 40-mesh screen	20% to 30%

For the purpose of these specifications, 1000 pounds of asphalt concrete composition for base course, shall be considered as sufficient to cover 24 square feet of roadway.

(B) Mixing and Laying:

(1) The plant wherein the materials are mixed, shall be provided with at least four separate bin compartments, for the storage of mineral aggregates.

All the mineral aggregate entering into the mixture shall be accurately weighed by means of multiple beam scales. Asphaltic cement shall be controlled and weighed separately from the mineral aggregate.

(2) All mineral aggregate shall be uniformly heated in suitable driers, to a temperature of between 300 and 400 degrees Fahrenheit, previous to being conveyed to mixer.

(3) The asphaltic cement shall be heated to such a temperature that, when discharged into the mixer, it shall have a temperature of not less than 200 degrees, nor more than 300 degrees Fahrenheit. At no time shall asphaltic cement be heated to a greater temperature than 325 degrees Fahrenheit.

On account of the close relationship existing between the base course and the wearing surface, and the resulting homogeneous character of the combined structure, I quote as follows from the same specifications pertaining to the wearing surface.

Binder Course

The binder course, after thorough compression, as hereinafter specified, shall be at least one and one-quarter inches thick, and shall be composed of crushed stone, gravel or crushed gravel, sand, stone dust or lime dust, and asphaltic cement, in the following proportions, by weight:

Passing a screen having 1" round openings and retained on a screen having ½" round openings	30% to 50%
Passing a screen having ½" round openings and retained on a screen having ¼" square openings	15% to 25%
Passing a screen having ¼" square openings and retained on a screen having 10 meshes to the linear inch	6% to 17%
Passing a screen having 10 meshes to the linear inch	22% to 35%
Asphaltic cement	5% to 7½%

Materials passing a 10-mesh screen shall conform to the following proportions by weight:

Passing a 200-mesh screen	10% to 18%
Passing an 80-mesh screen	30% to 45%
Passing a 40-mesh screen	60% to 80%

For the purpose of these specifications, 1000 pounds of mineral aggregate shall be considered as sufficient to cover 66 square feet of base surface.

Finishing Course

The finishing course, after thorough compression, as hereinafter specified, shall be at least one-quarter inch in thickness, and shall be composed of sand and asphaltic cement, in the following proportions, by weight:

Sand, passing a 200-mesh screen	10% to 20%
Sand, passing an 80-mesh screen, and retained on a 200-mesh screen	20% to 30%
Sand, passing a 40-mesh screen and retained on an 80-mesh screen	30% to 40%
Sand, passing a 10-mesh screen, and retained on a 40-mesh screen	20% to 30%
Asphaltic cement	10% to 14%

For the purpose of these specifications, 1000 pounds of Finishing course mixture shall be considered as sufficient to cover 400 square feet of surface.

The base course in the above specifications contemplates a 3½ inch thickness, and the wearing surface specifications contemplates a thickness of 1½ inches, making a total thickness of the combined structure, of 5 inches.

I desire to direct particular attention to those clauses in the specifications requiring a thousand pounds of mixture to cover only a specified maximum area of surface. We have found this specification to work out most successfully, and incidentally it removes one of the greatest points of contention between the Contractor and owner. This ratio of weight to area is based upon a mineral aggregate having a specific gravity of 2.80; if a mineral aggregate having a less specific gravity than 2.80 is used, it will result in a slightly thicker pavement.

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*County surveyor, Fresno Co., Cal., before the Convention of the Asphalt Association.

Fine Material

It has been common practice in the manufacture of asphaltic concrete, to use hydraulic cement or lime or the by-product of sugar beets to supply the necessary quantity of 200 mesh material, oftentimes lacking in fine aggregates. We wish to emphasize our experience that this practice results in a much inferior pavement than if these adulterations are eliminated; we therefore insist upon the importation of a sufficient quantity of 200 mesh sand, to bring the mineral aggregates to the proper proportions. I might mention here that in one case a local sand material was found in which the 200 mesh material predominated, resulting in the contractor having to install a blower to eliminate the surplus dust as the materials went through the heating rollers.

The devices for heating the mineral aggregate may be of the even drying type or by direct flame applied as the mineral passes through rotary steel cylinders. The present tendency seems to favor the latter type with the use of 48 inch cylinders.

Considerable expert knowledge is required for the proper mixing and laying of an asphaltic concrete pavement, and the lack of experieced labor, and inspection, will in nearly every case, prove disastrous. A sieve analysis of the aggregates should be made at least every hour at the plant, so that any material variations in the uniformity of the aggregate may be instantly detected and corrected. It is necessary that the asphalt be stored in waterproof containers, because the infiltration of even the smallest amount of moisture will cause the asphalt to form. Great care must be exercised by the mixer operator in weighing the proportions of aggregate from each bin; it is very easy to permit a few extra pounds of aggregate from any one bin to enter the mixing mill, by the careless manipulation of the scales and gates.

In warm weather we prefer to keep the temperature of the mixture from 250 to 260 degrees Fahrenheit; in cool weather, we generally employ a temperature of about 280 degrees Fahrenheit, subject to variations made necessary by conditions of distance hauled.

In spreading the mixture on the grade, we insist that the truck drivers become so experienced that the material can be spread upon the previously measured area so uniformly as to render it necessary to make but little adjustment with shovels; we find this method to be superior and more efficient than the use of mechanical spreaders.

Importance of Rolling

Rolling is a very important step in the construction of a proper asphaltic concrete pavement, and particular attention is given to this detail. Two 12-ton 3-wheel rollers are always on the job, and rolling is continued until no further compression is possible, and until the mixture has assumed its proper specific gravity, and will show no further marks by the rollers. Tranverse rolling is always employed on city streets, but in the case of comparatively narrow highways, tranverse rolling cannot always be accomplished; diligent diagonal rolling is, however, required. We are aware of the usual practice, in the employment of one 12-ton roller, and one 5-ton tandem roller, on asphaltic concrete construction. Our experience has brought us to the conclusion that the small tandem roller is of very little practicable use for any purpose other than, possibly, a finer polish; we therefore prefer to employ two rollers of the heavy compression type.

Inspection service is strenuous, both at the plant and on the street., Every operation is under constant control, and the resultant mixture very carefully watched. The plant inspector indicates the weight of every truck load of material on a card, which is taken by the truck driver to the inspector on the street, who then marks off the proper area upon which the material should be spread. Adjustments are made where necessary owing to inequalities in the subgrade. Raking is also an important factor in producing good results, and it is useless for any inexperienced man to attempt this work.

As an aid to maximum plant output, we find it advisable to have provided a compartment under the mixer to receive the contents of a mixer batch. By this expedient the mixing of materials will not be delayed by reason of a short delay on the part of trucks.

In ordinary weather, a load of mixed materials will retain its temperature remarkably well. We have frequently hauled this material 20 to 30 miles with a loss of only 4 to 5 degrees in temperature.

Traffic not Barred

We do not hesitate to permit traffic on the base course, after it has cooled. In fact we frequently lay a stretch of base, 5 miles or more in length, and permit the contractor to haul the wearing course mixture over it, up to a total gross truckload of 12 tons. We encourage the distribution of this traffic over the entire width of base, so that any serious defects in the subgrade will develop before the application of the wearing course, and any unevenness be corrected and absorbed by it. We find under such procedure that after a few weeks of traffic over the complete pavement the whole structure has become blended into one compact and integral mass.

In mixing the materials in the plant, we prefer that the coarse aggregate be placed in the mixing mill first, and then the fines and asphalt added gradually, so as to produce a complete and effective covering of every article of stone with the asphaltic cement.

Fresno county has employed coarse mineral aggregates of both rounded gravel surfaces, and of crushed quarried stone in which, of course, all surfaces are angular. The results of our experience are interesting. Contrary to the usually accepted theories, we obtained the better results with the use of round surfaces. We find that the crushed rock will bridge, one particle of stone against another. This bridging action is so effective that, unless crushed under the roller, it will prevent a thorough compaction. On the other hand, gravel aggregate, having rounded surfaces, will permit of sufficient displacement, internal movement, or adjustment, under the action of the roller, so that a much greater degree of compaction will result than in the case of quarried stone.

The ultimate result in the case of a gravel aggregate is a smooth riding surface, and in the case of quarried rock the fine aggregate tends to settle into the larger interstices of the coarse aggregate after a period of two or three month traffic and results in a slightly corrugated riding surface.

A pavement constructed in the manner as outlined, has certain peculiarities and advantages.

Detection of Faulty Subgrade

One advantage that seems to have been overlooked in professional papers is that a faulty subgrade can usually be detected before the pavement is completed, and correction made before serious injury will result. I refer to the fact that if the percentage of moisture in the subgrade exceeds 10 per cent. the heat of the mixture, emphasized by the action of the roller, will bring the moisture from the subgrade up to the surface in such measure that the mixture, being still hot and extremely plastic, will yield under the roller to the extent of disintegration. When such a condition develops, the faulty subgrade must be corrected before paving can proceed.

This does not mean that the mere fact of laying a pavement properly is a guarantee against future settlement in certain areas of subgrade; I have seen many instances where weaknesses will develop in a subgrade, sometimes from the natural weaknesses of the soil, and sometimes from unexplained causes. Where such defects do appear, we may readily avail ourselves of another important advantage of an asphaltic pavement; that is, that a repair can easily be made by the addition of an asphaltic patch. We can always be assured that such a patch will thoroughly anneal and blend with the old material. We therefore have a repair made upon a firmer foundation than before, at very little expense, and at only a few moments' inconvenience to traffic. In this connection, I might recite that, in order to correct an error of a contractor's, such a patch, averaging one-half to three-quarter inches in thickness was successfully placed over the entire width of a highway for a distance of one-half mile.

Asphaltic concrete, by reason of its plastic nature, is especially advantageous in its feature of maintaining constant contact with the subgrade. It does not therefore, have to be designed of sufficient strength to bridge over inequalities developing in a foundation. It transmits and distributes the superimposed load or impact, to the foundation subgrade, which after all has been said, must necessarily eventually bear the burden of traffic.

If an asphaltic concrete pavement is patched, to offset any depression developing in a subgrade, the pavement becomes better and stronger, and rests upon a better foundation than at the inspection.

Improve with Use

Contrary to the ordinary understanding that the deterioration of an article is in proportion to its use, we find, in the case of asphaltic concrete, that the full efficiency of the structure cannot be maintained except as it is put under a reasonable traffic duty. The slight internal movement of the particles in the structure has the effect of maintaining the high degree of resiliency so desirable in an asphaltic pavement. One has but to find an asphaltic pavement carrying very little, or no, traffic; it will be observed in such pavements that cracks and fractures appear, due to the non-use of the structure. The impact of traffic seems to forestall such a condition by reason of the malleability and resiliency of the asphaltic cement. Should serious fractures, from any cause, develop in an asphaltic pavement, they are readily healed by the application of a small amount of asphaltic mixture, and the waterproof qualities restored.

How Should Concrete Floors be Built?

Proper Construction Must be Used if Floors are to Wear Well and Give Good Service—A. C. I. Specifications are Recognized as Standard

(Continued from issue of September 19)

IV. Reinforced Concrete Floors

For reinforced concrete floors the following will apply in addition to paragraphs 1 to 19 inclusive.

A. FORMS

20. The forms shall be substantial, unyielding and so constructed that the concrete will conform to the designed dimensions and contours, and shall also be tight to prevent the leakage of mortar. The supports for floors shall not be removed until the concrete has hardened sufficiently and then only with the consent of the engineer or architect in charge. Permanent shores shall be placed in such a manner as to assure safety of the floors after temporary supports are removed.

When forms carrying concrete floors sag out of place before the concrete has hardened it is very difficult to force them back into position. Therefore, care should be taken before placing is commenced to have the forms and false work of such strength that there is no danger of sagging or failure.

The weight of a reinforced concrete floor is sometimes nearly equal to the load it is expected to carry. If sufficient time is not allowed for hardening there is possibility of failure, whereas an excellent floor would have resulted had it been allowed to harden properly before the supports were removed. This is especially true in cold weather, because concrete, without proper protection hardens very slowly if at all when the temperature is below 40 deg. Hence, it is safe to assume that a concrete floor gains practically no strength during the time exposed to low temperature.

B. REINFORCEMENT

21. Reinforcing metal shall be provided as called for on the plans. It shall be placed as indicated and mechanically held in position so that it will not become disarranged during the depositing of the concrete. Whenever it is necessary to splice tension reinforcement, the character of the splice shall be such as will develop its full strength. Splices at points of maximum stress shall be avoided. Splicing by lapping bars without contact with space between bars along the overlap equal to twice the thickness of the bars is preferable to mechanical splices or clamps.

The value of reinforcing steel depends upon position as well as quantity of steel. The designed strength of a floor is based on the assumption that the steel will be in the position shown on the plans. If the reinforcing is out of place its value will be decreased, or it may be subjected to possible corrosion because of insufficient protecting concrete below. A three-fourth (¾) inch covering should be the minimum and should be increased as conditions may require.

C. CONCRETE SLAB

Proportions

22. The concrete shall be mixed in the proportions by volume of one (1) sack of portland cement, two (2) cu. ft. of fine aggregate and four (4) cu. ft. of coarse aggregate.

Consistency

23. Only sufficient water shall be used to produce a workable plastic mix, which will flow sluggishly into the forms and around the reinforcement and which can be conveyed from the mixer to the forms without the separation of the coarse aggregate from the mortar.

Few engineers and contractors realize the damage caused by the use of too much water in mixing concrete. The statement is frequently made that excess mixing water does no harm because it soon runs off or evaporates, and that very wet concrete gains strength more rapidly than dry concrete, but this is not correct. A series of tests made at the Structural Materials Research Laboratory, Chicago, shows that the quantity of mixing water is probably the most important factor affecting the strength and durability of concrete, and that down to a point lower than can be reached in ordinary concrete work, the smaller the quantity of mixing water, the stronger will be the concrete. The use of one (1) pint more water than necessary in a one (1) bag batch decreases the strength and resistance to wear of the resulting concrete as much as though two (2) or three (3) pounds of cement were left out. Concrete of sloppy consistency has less than half the strength of concrete of the same proportions mixed with the proper amount of water. Therefore, the best rule is to use the minimum quantity of water that will produce a workable, plastic mix.

For reinforced concrete a somewhat wetter consistency is necessary in order that the mixture will settle readily around the reinforcing bars and fill all the spaces between them, but considerably less water should be used than is customary, and much better concrete would then result.

The slump test is a simple method for determining the proper consistency for the work in hand. A frustum of a cone four (4) inches in diameter at the top, 8 inches at the bottom and twelve (12) inches high, made of sheet metal is filled with the mixture to be tested, the concrete being puddled with a pointed metal rod while the cone is being filled. The cone is immediately lifted off and the settlement or slump noted. For a plain concrete floor slab the proper slump is one (1) inch to one and one-half (½) inches. A greater slump indicates the use of too much water. In some cases where the reinforcement is complicated the strength may be retained by adding a sufficient amount of cement to keep the water-cement ratio unchanged.

Placing

24. The concrete shall be placed in a manner to insure a smooth ceiling, and thoroughly worked around the reinforcement and into the recesses of the form. Concrete shall be deposited in its final position as soon as possible after mixing. It shall be struck off to a surface at least one (1) inch below the established grade of the finished surface of the floor. Workmen shall not be permitted to walk in freshly-laid concrete, and if sand or dust collects on the base, it shall be carefully removed before the wearing course is applied.

Joints

When it is necessary to make a joint in a floor slab, its location shall be designated by the architect or engineer; joints to be vertical.

Floor finish should not be divided or scored or blocked off by scoring tools except at structural expansion joints as this leads to rapid wear when subject to impact of traffic wheels.

D. WEARING COURSE

Proportions and Thickness

26. (Mixture No. 1) The mortar shall be mixed in the proportions of one (1) sack of portland cement, and two (2) cu. ft. of fine aggregate. The minimum thickness shall be three-quarters (¾) inch.

27. (Mixture No. 2) The mortar shall be mixed in the proportions of one (1) sack of portland cement, one (1) cu. ft. of fine aggregate and one (1) cu. ft. of No. 1 aggregate for wearing course. The minimum thickness shall be three-quarters (¾) inch.

Either of the two (2) mixes specified insures an excellent finish. As indicated in notes on aggregates, however, the No. 2 mixture using small pebbles or stone chips with sand resists abrasion better than No. 1 mixtures and is preferred where the floor will be subjected to heavy traffic.

Consistency

28. The mortar shall be of the driest consistency possible to work with a sawing motion of the strikeboard.

The above remarks on the consistency of the concrete for the slab apply with equal or added force to the wearing course, for this is the part of the floor which must withstand all the abrasive action of traffic.

Placing

29. The wearing course shall be placed immediately after mixing. It shall be deposited on the fresh concrete of the base before the latter has appreciably hardened, and brought to the established grade with a strikeboard.

Note. When placing the wearing course after the concrete slab has hardened, eliminate paragraph 29 and substitue paragraphs 30 and 31.

Where possible, the wearing course should be placed before the base course has hardened appreciably, because this insures a good bond and a practically monolithic floor. In case this is not possible, or when it is necessary to renew the wearing course on an old floor, the precautions given in paragraphs 30 and 31 should be carefully observed. Failure to do so may cause a poor bond, which may allow the wearing course to work loose from the base, crack and break up under traffic. Roughening the slab gives a mechanical bond. The slab should obviously be free from dirt and refuse. In order to reduce absorption of water from the fresh wearing course, which would prevent it from hardening properly, the slab should be moist, but not covered by a film of water, which might affect the bond. A grout of neat cement painted or brushed into the surface of the slab just before the wearing course is placed insures a thorough bond. Tests made by the Bureau of Standards have shown this to be more effective than special treatments. If these precautions are followed and the surface protected properly while hardening, a satisfactory, wear resistant floor will be secured.

Preparation of Slab

30. The surface of the slab shall be thoroughly roughened by picking or other means and cleaned of all dirt and debris.

Placing

31. The slab shall be thoroughly moist but free from pools of water when the grout and mortar for wearing course is placed. A neat cement grout shall be brushed on the surface of the slab, the wearing course immediately applied and brought to the established grade with a strikeboard. Grout and mortar shall be used within forty-five (45) minutes after mixing with water.

Finishing

32. After the wearing course has been brought to the established grade by means of a strikeboard, it shall be worked with a wood float in a manner which will thoroughly compact it and provide a surface free from depressions or irregularities of any kind. When

required, the surface shall be steel-troweled, but excessive working shall be avoided. A mixture of dry cement, sand and number one aggregate may be applied to the fresh concrete of the base for a wearing course, but in no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface of the wearing course to absorb moisture or to hasten the hardening. Special methods not conflicting with these specifications may be used.

Working the surface of a concrete floor with a good float smooths out any inequalities and compacts the surface without drawing to the top the finer particles of cement and sand. All of this adds to the value of the floor. Working with a steel trowel gives a smoother finish, but excessive troweling tends to bring fine particles in the mixture to the surface. These fine particles are not firmly cemented together and loosen rapidly under traffic, thus causing objectionable dust. The same objectionable feature results from sprinkling dry cement or a dry mixture of cement and sand on the finished surface.

In all cases, as soon as the floor has hardened sufficiently, it should be protected from too rapid drying by a covering of damp sand or by flooding with water.

Reference to special methods will permit the use of the so-called "monolithic method" of finishing concrete floors in buildings, but prohibits the practice of drying up excess water on the surface of a wearing course by dusting on a drier.

Coloring

33. If artificial coloring is used it must be incorporated with the entire wearing course and shall be mixed dry with the cement and aggregate until the mixture is of uniform color. In no case shall the amount of coloring exceed five (5) per cent. of the weight of the cement.

V. Plain Concrete Floors

For plain concrete floors the following will apply in addition to paragraphs 1 to 29 inclusive.

A. SUBGRADE

Preparation

34. All soft and spongy places shall be removed and all depressions filled with suitable materials which shall be thoroughly compacted in layers not exceeding six (6) inches in thickness. The subgrade shall be thoroughly tamped until it is brought to a firm unyielding surface.

Deep Fills

35. All fills shall be made in a manner satisfactory to the architect or engineer. The use of muck, quicksand, soft clay, spongy or perishable material is prohibited.

Drainage

36. When required, a suitable drainage system shall be installed and connected with sewers or other drains indicated by the engineer.

Depth

37. The subgrade shall not be less than —— inch below the finished surface of the floor.

Note. Subgrade to be —— inch below the finished surface of the floor when subbase is not required, and at least —— inch below when subbase is required.

B. SUBBASE

(Omit these sections when subbase is not required.)

Materials

38. Only clean, hard material, such as coarse gravel or steamboiler cinders, free from ash or particles of unburned coal, shall be used in the subbase.

Thickness

39. The material as specified shall be spread on the subgrade thoroughly rolled or tamped to a surface at least —— in. below the finished grade of the floor. On fills, the subbase shall extend to the full width of the fill.

Wetting

40. While compacting the subbase, the material shall be kept thoroughly wet, and shall be in that condition when the concrete is deposited.

Where concrete floors are laid directly on the ground, it must be firm and unyielding in order to support the floor properly. Spongy places cause the floor to settle unevenly and crack. If natural drainage is poor so that the subgrade may become saturated with water, a suitable drainage system should be provided, not only to prevent settlement, but also, in the case of basements, to insure watertightness

If the subgrade is of sand or gravel the floor can be laid directly upon it; otherwise a layer of coarse gravel or steam boiler cinders at least six (6) inches thick should be spread upon the subgrade and thoroughly compacted by wetting and rolling or tamping. A coarse, durable material is obviously necessary for this purpose.

As mentioned on page 11 the subbase should be wet when the concrete is deposited, in order to minimize loss of water from the concrete by absorption.

C. FORMS

Materials

41. Forms shall be free from warp and of sufficient strength to resist springing out of shape.

Setting

42. The forms shall be well staked or otherwise held to the established lines and grades and their upper edges shall conform to the established grade of the floor.

Treatment

43. All wood forms shall be thoroughly wetted and metal forms oiled or coated with soft soap or whitewash before depositing any material against them. All mortar and dirt shall be removed from the forms that have been previously used.

Forms for concrete, whether wood or metal, are more easily stripped and leave a smoother finish if they are coated with paraffin or some other oil before the concrete is deposited. Soft soap or whitewash answer the same purpose.

D. LIMITING CONDITIONS

Size of Slabs

44. The slabs or independently-divided blocks when not reinforced shall have an area of not more than one hundred (100) sq. ft., and shall not have dimensions greater than ten (10) ft. Larger slabs shall be reinforced as hereinafter provided.

Concrete, like most materials, expands and contracts with changes in temperature. Contraction of a floor laid on the ground induces tensile stresses because of the frictional resistance between the floor and the subbase. Where the floor is not provided with reinforcing it has comparatively little tensile strength and is liable to crack if the slabs are too great in any dimension. Experience has indicated that 10 feet is the maximum size of floor slab that should be used where exposed to wide temperature changes unless reinforced to resist temperature stresses.

Thickness of Floor

45. The thickness of the floor shall not be less than —— inches.

Width and Location of Joints

46. When required by the architect or engineer in charge, a one-half (½) inch space or joint shall be left between the floor and the walls and columns of the building, to be filled with the material before specified under "Joint Filler."

Protection of Edges

47. Where required by the architect or engineer in charge, the edges of the slabs at the joints shall be protected by metal.

(To be continued)

Eliminating the Irresponsible Bidder

A Committee of the Associated General Contractors is Investigating the Problem—Qualification of Bidders Before They are Allowed to Estimate Has Many Advantages

To define responsibility as applied to construction companies and to devise a practical means of selecting responsible bidders for a given project, is the task that has been undertaken by the Committee on Ethics of the Associated General Contractors. By this procedure, in which, it is believed, engineers and public officials will recognize a benefit to the industry, the association desires to remove the disagreeable controversies that frequently result when engineers disqualify an irresponsible bidder.

In the co-operative work which the Association has been doing with a number of their bodies almost every issue discussed has appeared to have some connection with this question of responsibility. The opinion has been frequently expressed by engineers and public officials that they would be glad to adopt certain contract principles, if they possessed the means for awarding contracts only to responsible companies. Some of these principles they are unwilling to adopt as long as they are practically obliged to award their contracts to any irresponsible company that can furnish a bond.

If these opinions represent a general conviction, it means that engineers and public officials do actually desire to eliminate "piker bids" and deal only with responsible companies, work along this line may reasonably be expected to result in a gradual easing up on the drasticness of contract provisions and a much higher regard for the construction business on the part of clients and professional men.

Several government and municipal bodies have, on special work, used the policy of receiving bids only from companies who could demonstrate their ability to execute the work, and it is commonly believed that public officials would favor the adoption of some plan whereby they could eliminate irresponsible bidders if they were able to do so without entailing a political fight, a taxpayers' injunction, or other unpleasant features attending the disqualification of a bidder.

Probably the most effective means of doing so is to require bidders to show their qualifications before they are given plans for estimating. If the Association devise some practical plan whereby engineers, architects, and public officials can ascertain the responsibility of any company with respect to a given project, many difficulties on both sides may reasonably be expected to disappear.

The Committee on Ethics, in undertaknig this important piece of work, is desirous that construction companies throughout the country give it their careful thought, and forward to the Washington office any suggestions bearing on the issue.

The following outline of points involved in the question of responsibility is offered for discussion:

Elements of Responsibility

1. Financial strength—
   (a) A financial statement to indicate the condition of the bidder's business.
   (b) Statement of funds available for the project.
   (c) Banking reference.
2. (a) Personal experience of construction manager, proprietor, partner or company officials in charge of construction.
   (b) Experience of superintendent now in employ of company, who is competent to execute the work.
   (c) Experience of superintendent (if not one of the above) who is to be placed in charge of work.
3. Construction plant available for project.
   (a) Equipment owned.
   (b) Equipment that will be rented or purchased.
4. Construction performance record.
   (a) Projects similar in character to the one being let.
   (b) Projects of any other nature.
   (c) Projects uncompleted through default.
5. Personal references for successful construction service.
   (a) Client owners.
   (b) Practicing engineers and architects.
   (c) Public officials.

Qualifying Bidders

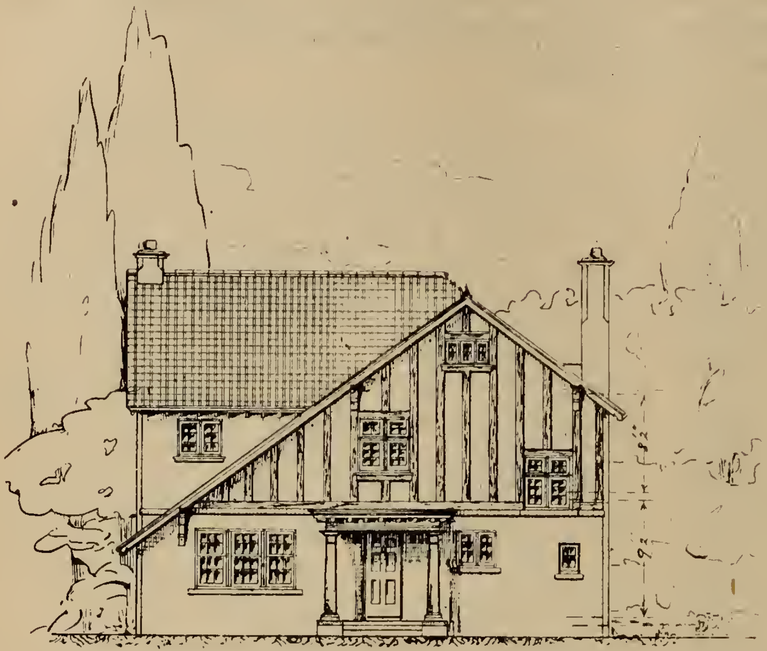
Qualification of bidders before they are allowed to submit proposals, instead of after bids are received offers the following advantages:

1. Relieves department from the criticism entailed when it rejects the bid of an irresponsible company that may be low.
2. Removes principal ground upon which a disqualified bidder can secure a taxpayers' injunction—namely, the award of a contract at a higher price.
3. Qualification can probably be handled more judiciously by the department when bidders have no checks on deposit and no proposals in the possession of the department.
4. The expense of field investigation and estimating is saved to the bidder who cannot qualify for a particular project.
5. Disqualification would probably receive less publicity and create less resentment in the disqualified ones.
6. With the issue of bonding not yet raised, the department would doubtless be free from pressure of bonding companies in the matter, and also from the influence of politicians or officials who might be interested in the placing of the bond.

Obituary

Major W. H. D. Murray, well-known railway contractor of Montreal, was accidentally killed a few days ago, when a revolver he was examining exploded in his hand. The accident occurred in Mr. Murray's office at Fabre, in the Temiskaming District, where he was engaged on the construction of a branch line for the C. P.R. Mr. Murray was overseas for four years with the Canadian Railway Construction Corps.

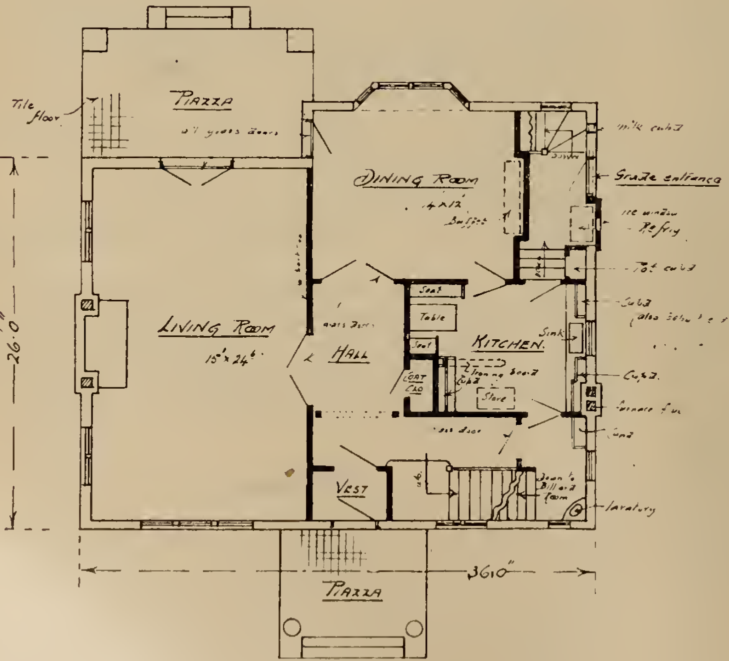
The Contract Record's Weekly House Suggestion No. 85

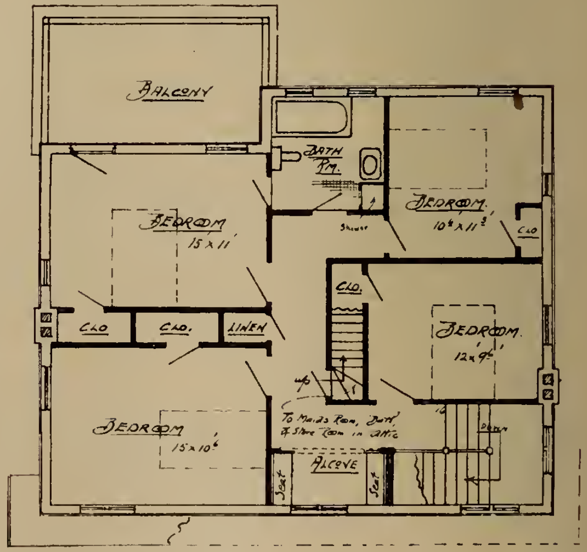


The subject of our series this week is a house of rather unusual plan, designed by Messrs. J. Hunt Stanford & Son, architects, of 67 Yonge St. Arcade, Toronto, for Mr. Geo. A. Clark. The house will be built on the south side of Alexandra Blvd., Toronto, and will cost, it is estimated, $11,500.

The ground floor layout gets away from the usual centre hall plan and gives the dining room, as well as the living room, a garden view and entrance. This is a particularly desirable feature when the house fronts to the North. The kitchen arrangement isolates this part of the house from the living room and dining room, yet it is within a few steps of the front entrance. The interior finish of the hall and living room will be in fumed oak; the dining room in gumwood with a walnut finish, and the kitchen, upstairs hall, bedrooms and bathroom in ivory enamel. The flooring will be of oak throughout, with the exceptions of the bathroom, where tile will be used, and the piazzas, which will be laid with a red quarry tile.

Provision is made in the basement for a billiard room under the living room. The balance of the basement will accommodate a boiler room under the kitchen and laundry under the dining room. The attic will contain maid's bedroom, bathroom and storage room.





Mainly Constructional

East and West—From Coast to Coast

With the recent awarding of the contract for the new $500,000 Devonshire Apartments at Vancouver, to Smith Bros. & Wilson, an actual start on the construction will soon be made. The new structure will be located on the northeast corner of George and Hornby Streets. As prepared by architects McCarter & Nairne, the plans show a handsome 7-storey structure, designed along Italian renaissance lines, that will have a frontage of 120 feet on Georgia Street and flankage of 125 feet on Hornby Street. The construction throughout is to be class A and fireproof. The frame is to be of reinforced concrete, while a handsome exterior will be secured by the use of Haddington Island dressed sandstone for the first floor. On the six floors above that a buff pressed brick will be used with terracotta trim and wrought iron dolphins, all supported on a massive concrete foundation. The Devonshire will have 122 suites of two and three rooms each. In the layout of each of the seven floors, provision is made by means of inter-communicating doorways for combining a number of these two and three-room suites into apartments of from four to six rooms to meet special demands.

It is understood that plans are completed to go ahead immediately with the construction of the Ottawa River Power Company's development at Bryson, 50 miles above Ottawa. This company is a subsidiary of the Ottawa and Hull Power Company, and owns a development at Bryson, Que., on the Ottawa River, capable of 60,000 horsepower development. First installation is to be one unit of 25,000 horsepower. Work is progressing on the transmission line to Ottawa, and this line will be completed by October 15.

The damming of Metis Lake, at the head of the Metis River, Matane County, P.Q., which was recommended by the Quebec Streams Commission some time ago, and recently approved by the Provincial Cabinet, will be commenced in the Spring. Tenders are being received by the commission until the 17th of this month. The work is expected to entail a total expenditure of about $2,000,000.

The members of the Engineering Institute of Canada who attended the recent professional meeting of the Maritime District, held at St. John, N.B., visited Courtenay Bay and viewed the work done on the huge St. John dry dock there. Another feature of the meeting was a visit of inspection to the hydro development at Musquash, N.B.

The superstructures of the two new buildings for the Western University, at London, Ont., are rapidly nearing completion, states a recent report, and it is anticipated that the exteriors will be finished before the real cold weather sets in, leaving only the interior finishing to be done during the winter months.

Drainage work carried out in the Big Grass Marsh district, Manitoba, during the war, at a cost of $250,000, has been rendered practically useless through soil drifting, and Hon. W. R. Clubb, minister of public works, announces that the government intends calling a conference to discuss the problem. The drainage work undertaken by the government was successful, as the drains carried off all the water. Before vegetation could be started, however, the light soil filled the drains and the land is becoming useless through being covered with water again.

A recent report from Port Arthur states that fine progress is being made towards completion of the Long Lac cut off, whereby connection will be made between the former Canadian Northern Railway and the Canadian National to the northeast of Lake Nipigon. Contractors state they expect to have the grade complete in about a week, when the steel gangs will commence laying rails.

Mr. Samuel B. Green, builder, of Toronto, has assigned, according to a recent announcement.

The Wentworth Quarry Company, Vinemount, P.Q., have applied for a surrender of their charter.

The number of permits issued for the month of September in North York Township, Ont., was the lowest since March, the value being $74,420. The value of permits for the year is approximately $686,370.

Port Arthur, Ont., will have a new ice arena this year. The Carter Halls Aldinger Co., of Winnipeg, have been awarded the contract for the construction of the rink, which will have an ice surface 85 x 185 ft. It will cost about $60,000.

Track-laying on the Swastika-Larder Lake branch of the T. & N. O. railway will commence in about six weeks, and the construction contractors' engines and cars should be running over parts of the new road in about two months, states a recent report. The right of way has been cut to the Crown Reserve and grading operations, held up recently by the bad weather are going ahead steadily.

A general meeting of the Montreal Branch of the Engineering Institute of Canada was held at their headquarters, 176 Mansfield Street, last Thursday evening, to open their season. An address was given by Mr. E. A. Forward, M.E.I.C., on "The St. Lawrence Deep Waterways," following up the recent address on the same subject by F. W. Cowie. Mr. Forward has devoted some years to the study of this question, and his paper brought up many matters of interest in Montreal.

A cement industry is to be established at Popcum, ten miles from Chilliwack, B.C., by a company known as the Mainland Cement Company. The company has secured the Hart & Damask property, which is rich in marle, and it is reported that work on the plant, representing an investment of about $1,000,000, will commence shortly.

That building has been active during the past construction season at Shawinigan Falls, P.Q., is indicated by an item we have received from Laflamme & Laflamme, contractors, of this town, who outline some of the important work they have had in hand this year. They supplied the timber for the La Gabelle dam, amounting to 1,500,000 f.b.m.; built an extension to the Canadian Carborundum Company's furnace room, 160 x 64 ft., also new transformer room at this plant; executed contract of filling of trestles and gullies at the plant of the Canadian Electric Products, also installed two railroad sidings, one 1,000 ft. long and the other about 800 ft. long, the latter for the Shawinigan Engineering Co. Ltd., at La Gabelle. At the present time they are working on excavating on the south side of the river St. Maurice for the dam at La Gabelle and are also building a reinforced concrete building for the Northern Aluminum Co. Ltd., 150 ft. x 60 ft., at an estimated cost of $75,000.

Personal

Mr. Alfred Hardman has been appointed superintendent of the Water Works Department at New Westminster, B.C.

Mr. Roy F. Smith, of Oakville, has been appointed engineer of roads for the county of Halton. The council at a recent meeting authorized the issuing of $90,000 worth of debentures to cover the county's cost of provincial roads.

Mr. J. M. Duncan, consulting and mechanical engineer, specializing in steam power and heating plants, has opened an office in room 27 at 32 Church St., Toronto.

CONSTRUCTIONAL ACTIVITY

Period of October 3 to October 9, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Burlington, Ont.
The town council is having plans prepared for sanitary sewers in Crosby Ave. from Caroline St. to Lew St. MacKay & MacKay, 72 James N., Hamilton, are the engineers.

Dundas, Ont.
Public Utilities Commission are having plans prepared for waterworks extension on Ogilvie, Witherspoon, Market, Matilda Sts., Governor's Rd. and West. W. M. Mount is the superintendent in charge.

East London, Ont.
The city council is having plans prepared for laying of pavement, sewers and watermains in industrial area, costing $90,000. W. P. Near is the engineer.

Fort St. John, B. C.
Work is to start shortly for 175 miles of sleigh road from Fort St. John to Fort Nelson, Peace River district. Engineer in charge is Patrick Philip. Work by day labor.

Forest, Ont.
The town council contemplates a waterworks system costing $100,000, and has under consideration putting down test wells before proceeding with the work. Chapman & Power, Mail Bldg., Toronto, are the engineers.

Hamilton, Ont.
The city council is having plans prepared for the laying of watermains in Westdale, Dalewood, Naymore, Haddon and Arnold Sts. W. L. McFaul is the engineer.

Metis Lake, Que.
Tenders are being received by Quebec Streams Commission, 59 Notre Dame St. E., Montreal, until October 17, for wooden dam 918 ft. long and 5 slides for dog-yokes. Plans and specifications with the engineer, O. Lefebre, 59 Notre Dame E.

Midland, Ont.
The town council contemplate the laying of concrete sidewalks at a cost of $20,000. Work will probably go ahead in the spring.

Oshawa, Ont.
The town council contemplates improvements to watermains to cost $50,000, which will include a storage tank and equipment. W. Smiith is the engineer.

The town council contemplate the laying of sidewalks on Alice St., Athol St. and Arthur St. W. C. Smith is the engineer.

The town council will shortly call tenders for laying of sewers in Cedarvale, the new subdivision, to cost $19,000. Mr W. C. Smith is the engineer in charge.

The town council contemplates a watermain extension on Ritson Rd. W. C. Smith is the engineer.

Palmerston, Ont.
The town council contemplates extending 4 in. watermains on Prospect and Toronto Sts.

South London, Ont.
Work is expected to start in November, for sanitary sewers on Wellington Road to cost $300,000. Day labor under supervision of city engineer, W. P. Near.

Windsor, Ont.
The city council propose laying sewers in Ellis Ave. from Bruce to Janette Ave.

CONTRACTS AWARDED

Ford, Ont.
The town council has awarded the contract for pavement on Sandwich St., to Merlo, Merlo & Ray, Ford, Ont., at $76,665.50.

Newmarket, Ont.
The town council has awarded the contract for watermains costing $4,500 to P. Simon, 133 Monarch Park Ave. Toronto. The engineers are James, Proctor & Redfern, Ltd., Toronto.

Oshawa, Ont.
The contract for paving on Simcoe St. N. from Alexandra St. to limits, has been awarded to the Standard Paving Ltd., Ottawa, at $5.95 per lin ft. W. C Smith is the engineer.

Point Grey, B. C.
The Vancouver and District Joint Sewerage Board have awarded the contract for dredging outfall foot of Balaclava St. to Grant Smith & Co., & Macdonell, Ltd., Vancouver, at $14,500. Contract includes dredging channel 1700 ft. into English Bay on basis of 85c per cubic yard.

Sandwich, Ont.
Webster Construction Co., Ltd., 134 Darling St., London, Ont., have been awarded the contract for storm sewers at $10,020.

Windsor, Ont.
The city council has awarded the contract for pavement at $18,000 to the Premier Construction Co., Walkerville, Ont.

Railroads, Bridges and Wharves

Lingan, N. S.
Work is now in progress on 2 miles of railroad costing $25,000 from Lingan to New Waterford, N. S., for the Dominion Coal Co, Glace Bay. Engineers are Jas. R. Morrison and Alex. Hay, of Glace Bay. Chief engineer is Jno. S. White.

Oshawa, Ont.
The Oshawa Railway Co. have started laying tracks on Simcoe St. N. from Alexandra St. to limits. Work by day labor.

Port Stanley, Ont.
Tenders are being received till October 22 by the Department of Public Works, Ottawa, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for construction of an east pier and a sheet pile wall. Plans and specifications at department, at offices of district engineers, Royal Bank Bldg., London, Equity Bldg., Toronto, and at post office, Port Stanley.

St. Louis de France, Que.
Work has just started for a new railroad branch costing $150,000 from Piles Jct. to St. Maurice Lime Plant. The owners are the Canadian Pacific Rly., and St. Maurice Lime Co. Ltd., Three Rivers, Que. Superintendent—O. W. Lavoie, Montreal. Work day labor under supervision of Mr. Hopper.

Sturgeon Falls, Ont.
Tenders are being received till October 12, by the Dept. of Public Works through the secretary, R C. Desrochers, for the construction of a public wharf. Plans and specifications at Dep't. office, at post offices, North Bay and Sturgeon Falls, Ont.

Three Rivers, Que.
Work has just started on wharf conveyors costing $100,000 for the Three Rivers Harbor Commission. Consulting engineer, A. D. Swan, Birks Bldg., Montreal. Work day labor under supervision of district engineer, B. Grandmount, who buys materials.

Vancouver, B. C.
Tenders are being received till October 17 by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for dredging required at G. T. P. dock.

CONTRACTS AWARDED

Burlington, Ont.
The contract for reconstruction of south pier of Burlington Channel has been awarded to Port Arthur Construction Co. Ltd., Toronto at $46,000.

Province of Quebec.
Federal Construction Co. Ltd., Reford Bldg., Toronto, have been awarded the contract for railway constructon (Donnacona cut off) by the Canadian National Railways, Montreal, who will lay all steel rails.

Public Buildings, Churches and Schools

Aylmer, Ont.
W. B. Riddell, 507 Maitland St, London, is the architect in connection with contemplated $10,000 addition to high school Plans will likey be revised and new tenders called shortly.

Hamilton, Ont.
The R C. Corporation are having

plans prepared for a $50,000 church on Herkimer St. Priest in Charge is Rev. Father Lawrence, 260 Herkimer St.

Halifax, N. S.

The Ancient order of Hibernians contemplate the erection of a temple here.

London, Ont.

The Board of Governors, Western University, contemplate building an $80,000 concrete stadium with 5,000 seating capacity. Work will not proceed before next spring.

Montreal, Que.

Tenders are being received by Executive Committee for electric, plumbing, heating and ventilating in connection with new city hall. No closing date set. Architect, Louis Parent, City Hall.

Tenders are being received by the architect, S. Comber, 127 Stanley St., Montreal, for foundations in connection with $75,000 church for Westmount Baptist Church. No closing date set.

Outremont, Que.

A $600,000 convent corner Courcellette and Maplewood, is contemplated by the Sisters of the Holy Names of Jesus and Mary, 1857 Notre Dame St. E. This project will likely go ahead in spring of 1924.

Oshawa, Ont.

The ratepayers of Oshawa have passed a by-law authorizing the expenditure of $25,000 for a grandstand in Alexandria Park. The architects are Hutton & Sonter, 804 Bank of Hamilton Bldg., Hamilton, Ont.

The town council contemplate building a $200,000 municipal hall on Simcoe St. S.

Tenders are being received by the general contractor, Ed. Monette, King Edward St., no closing date set, on roofing, sheet metal, electric, plastering and painting in connection with $40,000 fire station. No materials purchased. Millson, Burgess & Hazlegrove, 185 Sparks St., Ottawa, are the architects.

Port Arthur, Ont.

Tenders for heating, plumbing and electric wiring in connection with $175,000 court house will be received by the Dep't. of Public Works, Toronto, Ont., till October 13th. Plans and specifications with Howe Engineering Co., Port Arthur. J. McDiarmid Co. Ltd., Winnipeg, Man., are the general contractors

Point Grey, B. C.

Tenders will be received by the architects, Sharp & Thompson, 904 London Bldg., Vancouver, B.C., till October 22 for the erection of a library on university campus. Stone and reinforced concrete construction.

Sussex, N. B.

Tenders are being received till October 17 by the Dep't. of Public Works, through the secretary R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for alterations to fittings in post office. Plans and specifications at offices of chief architect, Dep't. of Puplic Works, Ottawa, res. architect, general post office, St. John, and the caretaker, Public Bldg., Sussex, N. B.

Stratford, Ont.

T. Hepburn, Downie St., is preparing plans for a church for the Gospel Hall. Market Place. 1 storey, 75 x 32, brick construction.

Toronto, Ont.

The Hydro Electric Power Commission of Ontario are having plans drawn for a $20,000 waiting room at Lake Shore Rd. and Jane St. 1 storey, 30 x 50, brick construction. Chief engineer is Mr. Gaby.

CONTRACTS AWARDED

Asbestos, Que.

Trussed Concrete Steel Co., Montreal, have the contract for structural steel in connection with $250,000 church being built here. Architect, L. N. Audet, 32 Wellington St. N.; general contractors—Poudrier & Boulet, Black Lake, Que. Cut stone, millwork, roofing, sheet metal, electric, plastering, painting, glazing and ornamental iron to be let. General contractors are receiving prices on all materials.

Brantford, Ont.

The walls are up 1 storey for $60,000 high school. General contractor, Jas. Bogue, 220 Dublin St., Peterboro; architect, D. R Franklin, 587½ Yonge St., Toronto. The following sub-trades have been let: structural steel and orn. iron—McGregor & McIntyre Ltd., 1139 Shaw St., Toronto; brick—John Price Ltd., 395 Greenwood Ave., Toronto; hollow tile—Interlocking Tile Co. Ltd., 32 Toronto St., Toronto; millwork—John R. Eaton & Co., Orillia, Ont.; roofing and sheet metal—Pursley & King, 639 St. Clarens Ave., Toronto; electric—Patterson Electric Co., 615 Yonge St., Toronto; plumbing and heating—Fred. Landon, Whitby, Ont.; plastering painting and glazing—to be let by general contractor; gypsum—Ebsary Gypsum Co. Ltd., Temple Bldg., Toronto.

Banff, Alta.

The contract for $33,000 school has been awarded to Bennett & Whilt Construction Co. Ltd., Calgary, Alta. MacDonald & Gagoon, Edmonton, Alta., are the architects.

Birtle, Man.

A. Dykeman, Portage La Prairie, Man., has the general contract for $10,000 hospital being built here. J. W. Ramez, Portage La Prairie, has the contract for plumbing. Architect, W. Fingland, 313 Fort St., Winnipeg.

Freeport, Ont.

The contract for plumbing in connection with alterations and addition to water system of Freeport Sanitarium, has been awarded to P. Atkinson, Preston, Ont.

Glace Bay, N. S.

The following sub-trades have been let on $15,000 hall and shops being built for the Loyal Orange Lodge: plumbing and heating—Stanley Richard, Fletcher St., at $1,000; painting—D. D. Moore Union St., at $1,000. Foreman in charge of work is Mr. McAuley, 88 Dorchester St., Sydney, N. S.

Hamilton, Ont.

P. Smith, Kensington Ave., has the contract for heating, and Fred Skeddon, 224 Robinson St., the contract for windows, painting and glazing, in connection with church being built for the King St. Baptist Church. J. K. Connors, 31 Lamoreaux St. is the general contractor.

Kapuskasing, Ont.

The following sub-trades have been let on community hall being built for the Spruce Falls Co.; electric— Robinson & Robinson, Hamilton; plumbing and heating— McAlindon & McCormick, Cochrane; plastering—W. Mountain, Hamilton; painting—day labor. Stuart & Sinclair, Hamilton, are the general contractors. Architect, W. L. Somerville, 2 Bloor W., Toronto.

London, Ont.

The foundations are going in for a central heating plant to heat business block and adjoining buildings. Boiler house--Sonley & Schreiber, 146 Cambridge St.; plumbing—R. Milne, 348 Talbot St.; boilers—E. Leonard, York St.

Montreal, Que.

Douglas Bros. Co. Ltd., 10 Benoit St., have the contract for roofing, and R. D. Clark & Sons, Ltd., 26 Lincoln, the contract for plastering in connection with $200,000 church being built on Sherbrooke St. W. Cook Downing & Co., 10 Cathcart St, are the general contractors. Ross & MacDonald, 1 Belmont St., are the architects.

North Bay, Ont.

E. Finnegan, North Bay, has the contract for masonry work in connection with $26,000 parish hall being built for the Anglican church. Jeffries & Stevens, 23 McIntyre, are the builders. Electric, heating, plumbing, plastering, painting and ventilating to be let later.

New Liskeard, Ont.

The walls are going up for school for R. C. Separate Board. J. P. Vachon is the general contractor; plumbing—Haileybury Plumbing & Heating Co.; electric—Wood & Ryder, Haileybury.

Niagara Falls, Ont.

Flynn Bros., Centre St., have the contract for heating, and L. C. Biggar, Lundys Lane, the contract for painting in connection with $11,000 addition to Nurses Home for Niagara Falls Hospital Trust. Wm. L. Somerville, 1 Bloor West, Toronto, is the architect.

Oshawa, Ont.

The board of education has awarded the general contract for addition to collegiate institute to Schultz Bros. & Co., Ltd., Brantford, Ont., at $246,000. Hutton & Souter, Bank of Hamilton Bldg., Hamilton, are the architects.

Ottawa, Ont.

The following sub-trades have been let on $70,000 church being built for St. Pauls Methodist Church; plumbing and heating (Durham system)—Band & Cole. electric—Stan. Lewis, 63 Metcalfe St. Architect—C. J. Burritt. Hope Chambers; supervisor— A. E. Shaver, 225 1st Ave.

Sault Ste. Marie, Ont.

McIntyre & Kelly Bros. have the general contract for a $9,000 mission being built for the Presbyterian church. Findlay & Foulis, Queen St., are the architects. Electric, plumbing, heating, plastering and painting to be let by general contractors.

Selkirk, Man.

The general contract for completion of power house, Hospital for Mental Diseases, has been awarded to J. McDiarmid Co., Ltd., Winnipeg, Man., at $37,835.

Tavistock, Ont.

Conrad Fuller, Phillipsburg, has the contract for carpentry work in connection with a $12,600 skating rink and assembly hall for the Tavistock Rink Co Ltd. Architect, Geo. Kneisel. General contractors, Zimmerman Bros, Ltd.

Three Rivers, Que.

Work is to start at once for a $42,000

convent for Les Filles de Jesus, Three Rivers. Architect, Jules Caron, 21 St. Joseph St.; general contractor—U. W. Rausseau, Cap de la Marcleine.

Tranquille, B.C.

H. J. Davies, Kamloops, B.C., has the general contract for farm buildings costing $30,000, for Tranquille Sanitarium. Roofing, electric, plumbing, heating and plastering to be let.

Victoria, B. C.

The following sub-trades have been let on $150,000 terminal building being built for the Canadian Pacific Railway: reinforced steel—Trussed Concrete Steel Co., Vancouver; stone—McDonald Bros., Vancouver; marble and tile— Wm. N. O'Neil & Co., Ltd., Victoria; roofing—Pacific Sheet Metal Works, Ltd., Victoria. electric—Hawkins & Hayward; plumbing and heating—W. R. Menzies & Co.; painting—Melrose Co. Ltd.; millwork—Lemon Gonnason Co., Ltd.; Luney Bros. Ltd., Victoria, are the general contractors. Architect, F. M. Rattenbury, 1701 Beach Drive, Victoria.

Work is to start at once on $72,000 synod hall for Anglican church congregation. Parfitt Bros., Ltd., 1303 Gladstone Ave., Victoria, have the general contract. Architect, J. C. M. Keith, Victoria, B. C.

West London, Ont.

The foundations are going in for $300,000 arena at Tecumseh Park. Architects, Watt & Blackwell, Bank of Toronto Chambers; general contractor, John Putherbough, 396 Talbot St.; steel—London Bridge Works Ltd.; electric—Knowles Electric Co., London, Ont. Contract for 125,000 brick awarded to Cooksville Shale Brick Co., Cooksville, Ont.

Woodstock, Ont.

Frank Bottoms, 593 Grace St. has the contract for painting in connection with $100,000 addition to Central school. Plastering is being done by the general contractor, W. J. Taylor, 14 Wellington St. Architect, J. H. Grenfell, 21 Dundas St.

Winnipeg, Man.

The following sub-trades have been let on $60,000 power house and laundry for Grace Hospital; cut stone—Tyndall Quarry Co.; painting—Gates Painting & Decorating Co. Ltd.; ornamental iron—Vulcan Iron Works, Ltd.; miscellaneous iron—Manitoba Bridge & Iron Works, Ltd. Wallace & Akins, Ltd., Winnipeg, have the general contract . Architect, J. N. Semmens, 509 Great West Permanent Bldg., Winnipeg.

Business Buildings and Industrial Plants

Acton, Ont.

Charles Parker is the owner and general contractor of $9,000 warehouse being built on Young St.

Amherstburg, Ont.

Negotiations are in progress for the building of a glass factory. A. A. Icenhour is the owner

Cap de la Madeleine, Que.

The Cap Film Productions, Ltd., Cap de la Madeleine, contemplate building a $75,000 studio here. Architect, Jules Caron, 21 St. Joseph St., Three Rivers, Que Engineer, Romeo Morissette.

Guelph, Ont.

Work has just started on rebuilding plant of Malt Products Co. of Canada, Ltd., at a cost of $6,000. Work of repairing roof and interior day labor under supervision of manager, Mr. O. G. Lye.

Halifax, N. S.

Pickerings & Roland, architects, Roy Bldg., are preparing plans for alterations to warehouse of A. M. Bell & Co., to cost $10,000.

Kirkland Lake, Ont.

Tenders are being received by the architect, W. L. Somerville, 2 Bloor W., Toronto, on all trades in connection with a bank building for the Imperial Bank of Canada. No closing date set.

London, Ont.

Sid. Jones, 374 Tecumseh Ave., contemplates building a $25,000 factory for manufacturing mastic flooring.

Public Utilities Commissioners are building a $5,200 garage and gasoline house on Horton St.; 1 storey, 45 x 78, concrete brock construction. Owners will look after all work.

Leaside, Ont.

Durant Motors of Canada Ltd., Leaside, are having plans drawn for an office building here. 2 storey, reinforced concrete.

Montreal, Que.

Tenders are being received by the architect, Sydney Comber, 127 Stanley St., for an extension to bakery of Jas. Strachan Ltd., 246 City Hall Ave. No closing date set.

H. Rayment, 412-1st Ave., Ros., contemplates building a public garage on First Ave. near Masson St., Ros., and will probably let sub-trades. No materials purchased.

Ottawa, Ont.

The excavating work has started for a garage, machine shop and power house for the Ottawa Electric Railway Co. Architects are Richards & Abra, Home Bank Bldg. John Sutherland is the superintendent in charge. Power house will require a booster generator costing about $50,000.

Popcum, B. C.

Mainland Portland Cement Co., Vancouver, propose erecting a modern plant here in the near future, estimated to cost $1,000,000.

Rapid City, Man.

Tenders will be received by the owners, T. Eaton Co., Ltd., Winnipeg, Man., for an addition to dairy, reinforced concrete construction. No closing date set. Plans and specifications at the offices of MacLean Building Reports, Ltd., 325 Main St., Winnipeg, Man.

Ridgetown, Ont.

Plans are being prepared for a $10,000 garage and service station. Ernest Fysh is the owner.

Sarnia, Ont.

Dominion Alloy Steel Corp., Toronto contemplate building a $6,000,000 steel plant here. Superintendent of building is Geo. A. Simpson. Charlton apartments, Hamilton. Engineering work will be done by company's own engineers at Sarnia. Tenders for steel and foundation work may be called next month.

Toronto, Ont.

Tenders are still being received on laying 140,000 bricks for garage being built east side Yonge St. near Manor Rd. G. M. McKeown 368 Mt. Pleasant Rd. is the owner.

Tenders are being received till October 13 by P. McClelland, owner, Capital theatre, corner Castlefield Ave, and Yonge St., on all trades in connection with addition to Capital theatre, stores and offices. Plans and specifications with owner. No materials purchased. Murray Brown, Confederation Life Bldg., is the architect.

W. G. Hunt, architect, Confederation Life Bldg., is preparing plans for a $10,000 service station etc., south east corner Bloor and Windermere Ave., for John Berezanski, 264 Dovercourt Rd.

W. A. Roder, 169 Withrow Ave., contemplate building 2 stores, $7,000 each. on north side Danforth near Sibley Ave. 2 storeys, brick construction.

D. H. Burnham, 266 Lauder Ave., is preparing plans for an office, printing plant and warehouse on Oakwood near Vaughan Rd. for Oakwood Press (F. J. McLean), 366 Oakwood Ave. All trades to be let.

CONTRACTS AWARDED

Cochrane, Ont.

The walls are going up for a $5,000 addition to hotel, corner 7th Ave. and Railroad St. James Palangio is the owner and builder. Architect—W. H. Bishop; painting—Peel & Keterly. Carpentry, roofing, electric, plumbing and heating to be let. Plastering is being done by owner.

Hamilton, Ont.

W. H. Yates Construction Co., 17 Main St. E., have been awarded the contract for foundation work of foundry building being built on Aberdeen West, for the Canadian Westinghouse Co. Architect, B. H. Prack, Main St. E.. Hamilton, and 50 Bay St., Toronto.

Kapuskasing, Ont.

Stuart E. Sinclair, Jackson St. E., has the general contract for a bank building being erected for the Imperial Bank of Canada. electrical—Robinson & Robinson, Hamilton; plumbing and heating—McAlindon & McCormick, Cochrane; plastering—W. Mountain, Hamilton; painting—day labor. W. L. Somerville, 2 Bloor St. W., Toronto, is the architect.

W. H. Bishop, Cochrane, Ont., has the general contract for a store and warehouse for the Kapuskasing Supply Co. W. L. Somerville, 2 Bloor W., Toronto, is the architect.

London, Ont.

The walls are going up for warehouse for Fireproof Warehousing Co., 717 Richmond St. Jno. M. Moore, 489 Richmond St., is the architect. General contractor—John Rutherbough, 396 Talbot St. Electric—Public Utilities Commission.

Montreal, Que.

The walls are going up for $3,000,000 building for the Insurance Exchange Corp., Ltd., Montreal. Architect, D. J. Spence, 246 Beaver Hall Hill; general contractors — Anglin-Norcross, Ltd., 65 Victoria Sq.; roofing—Douglas Bros., 10 Benoit St.

E. R. Tucker, 120 Congregation, has the contract for plumbing, and Hobbs Mfg. Co., Ld., 444 St. James St., the contract for painting, in connection with

$25,000 molasses distillery being built for the Commercial Alcohol Co. Architect, F. Robb; general contractors, Bannell Bros., 341 Guy St.

Jas Shearer & Co., 225 St. Patrick St., are the general contractors for $5,000 storage building being built for Canadian Paper Board Co., 2 Seigneurs St.

M.Chouinard, 751 Adam St., has been awarded the roofing contract in connec tion with $100,000 warehouse being built on Craig St. near St. Denis for A. Prudhomme & Fils Ltd., 10 De Bresoles St. Art. Leduc, 351 Christophe Colomb St. is the general contractor. A. E. Doucet, 195 St. Catherine St. E., is the architect.

Dominion Bridge Co. Ltd., Lachine, Que., have the contract for structural steel for a $7,000 lunch room being built at 425 Richmond St. for Toilet Laundries. Bonnel Bros., 341 Guy St., are the general contractors.

Ottawa, Ont.

The following sub-trades have been let on $300,000 bank building being erected for the Bank of Nova Scotia; roofing, sheet metal, waterproofing, plumbing, heating and ventilating—McKinley & Northwood, 56 Rideau St.; excavating —Ontario Foundation & Engineering Co., Toronto; electric wiring—Fred. A. Wilson, 226 Bank St.: marble—Smith Marble Construction Co., Ltd., Montreal. Architect—John M. Lyle, 230 Bloor W., Toronto. Carswell Construction Co. Ltd., Toronto, are the general contractors.

Work is to start shortly on a $14,000 garage on Wellington St. D. Charlebois, 691 Wellington St., is the owner. J. B. Doust, Westboro has the contract for tearing down old bulding and excavating.

Sandwich, Ont.

Ed. Wells, 530 Bruce Ave has the contract for masonry in connection with remodelling business block to cost $15,000. Electric, plumbng, plastering and painting to be let. Dr. Campbell, Blenheim, Ont., is the owner.

Simcoe, Ont.

James A. Vance, Woodstock, Ont., has been awarded the general contract for $25,000 addition to plant of City Dairy Co., Ltd. Engineers in charge of work are Messrs. Gore, Nasmith & Storrie, Conederation Life Bldg., Toronto.

Smiths Falls, Ont.

The following sub-trades have been let on stores being built on Russell St. costing $45,000; electric—John Fader; plumbing—Harry Hagan; heating—Cameron & Leacock; plastering — Thos. Manders. Adam Foster is the owner.

Toronto, Ont.

The foundations are going in for public garage and showroom costing $15,000, north side Danforth Ave. near Dawes Rd. J. Hanson, 280 Main St. is the owner. Architect, J. I. English, 37 Leonard Ave.; general contractor— E. J. Elliott, 279 Main St.; electric—Taylor Bros., 25½ Norwood Ave.; heating and plumbing—Duffort Bros., 862 Kingston Rd. Steel and painting to be let.

Geo. F. Sims, Weston, Ont., has the contract for carpentry work, and Mr. Jennings, 49 St. Clair West, the con tract for masonry, in connection with business block being built south west corner Yonge and St. Clair, for the Canadian Bank of ommerce. Architects—Dominion Realty Co., 23 King West. Other trades not let yet.

The walls are now going up for $20,000 garage at 360-2 Spadina Ave., for Geller Bros., 288 Spadina Ave. Architect—B. Brown, 287 Spadina Ave.. general contractors-- H. B. Kennedy Construction Co. Roofing, electric, heating and plumbing to be let.

The foundations are going in for $175,000 office building corner Gerrard and Yonge Sts., for the Canada Life Assurance Co. Superintendent of Building—W.R. Dunlop, 42 King West; architects—Sproatt & Rolph, 1162 Bay St.; general contractors—P. H. Secord & Sons Construction Co. Ltd.; cut stone— Geo. Oakley & Son, Ltd.. roofing, painting, glazing, marble, tile and mill work to be let.

Bennett & Wright,72 Queen E., have the contract for electrical work in connection with $100,000 garage etc., being built for the City Dairy Co., Ltd. Engineers in charge are Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto; general contractors—Sullvan & Fried.

The walls are going up for $100,000 manufacturing building north east corner Spadina Ave. and Phoebe St., for the Empire Clothing Mfg. Co. Architect— B. Brown, 287 Spadina Ave.; general contractor—L. E. Dowling, 167 Yonge Yongs St. Roofing, electric, plumbing, plastering, heating and painting to be let by general contractor.

The following general contractors are submitting tenders and want prices on all trades in connection with sub-station south east corner Danforth Ave. and Morton Rd., for Toronto Electric Commissioners: C. W. Power, 20 Triller Ave.; J. W. Hewitt, 56 Roncesvalles Ave.; R. Chalkley & Son Ltd., 258½ Avenue Rd.; Archibald & Holmes, 709 Yonge St.; Dickie Construction Co. Ltd., Ryrie Bldg.; Wells & Grey Ltd., Lumsden Bldg.; Jackson-Lewis Co. Ltd., Ryrie Bldg.; Carswell Construction Co. Ltd., 58 Wellington E.; Jno. V. Gray Construction Co. Ltd., 541 Queen E.; P. H. Secord & Sons Construction Co. Ltd., Temple Bldg.;Gratton Ltd., 486 Clinton St.; E. Teagle & Son, 310 Davenport Rd.; R. A. Rogers, 107 Hiawatha Rd.; Sullivan & Fried, 81 Victoria St.; A. C. Salisbury, 669 Pape Ave.; Norman McLeod Ltd., Kent Bldg.; Witchall & Son, 156 St. Helens Ave.; James A. Wickett Ltd, 16 Saulter St.; Canadian Construction Co., 417 Continental Life Bldg.; H. C. Johnston, Lumsden Bldg.

Thomson Bros., Ryrie Bldg., Toronto, has the general contract for a paint plant being built south west corner Phoebe and Soho Sts., for R. Elder Carriage Works, Ltd., 26 Soho St.

J. Robert Page, 18 Toronto St., has the general contract for a $15,000 addition to garage rear 621 Yonge St., for Jos. H. Doane, 30 Isabella. St. Masonry and carpentry being done by general contractor. Other trades to be let. No materials purchased.

G. Doner, 115 Melville Ave., has the general contract for $7,500 boiler house corner Phelan and Osler Ave., for the Canadian Sidway Co., Ltd., 97 Phelan Ave.

Ville LaSalle, Que.

The foundations are going in for an extension to building of Montreal Light, Heat & Power Co. D. G. Loomis & Son, 1112 St. Patrick, are the general contractors. Masonry, structural steel and roofing to be let.

Waterloo, Ont.

Ball Bros., 32 Simeon St., Kitchener, Ont., have been awarded the general contract for a $20,000 freight shed for the Grand River Railway Co. Electric, painting, plumbing and heating to be let.

Welland, Ont.

The general contract for $40,000 garage and repair shop has been awarded to William Mitchell. W. G. Somerville & Son, 36 Main St. N., are the owners.

Residences

Hamilton, Ont.

Wm. Lyon, 86 John St. N., is the owner and general contractor of 3 residences costing $9,000 on McAnulty Blvd., and will let trades.

Limoilou, Que.

Eugene Lemay Ltee., 46 Lasarre St., are the owners and builders of 22 residences costing $88,000 on St. Charles Park. 2 stores, 20 x 28, brick and terra cotta construction.

London, Ont.

C. A. Vanderlande, architect, 1023 King St., is preparing plans for a $15,000 apartment house. 2 stories, 32 x 55, stucco or ordinary brick construction.

W. Stuart Pavey, architect, Standard Bank Bldg., London, is preparing plans for a $12,000 residence to be built on Victoria St. for Col. F. B. Ware, 476 Colborne St.

Montreal, Que.

E. Mitchell, 2131 Lafontaine, is the owner and builder of $10,000 residence on Lafontaine, between Bennett and Wm. David Sts. Masonry, millwork, roofing, electric, plumbing and plastering to be let.

The foundations are in for $9,000 residence on St. Hubert St., between Villeray and Faillon. E. Davis, 3219 St. Hubert, is the owner and builder. Masonry, millwork, roofing, electric, plumbing and plastering to be let.

F. Deslauriers, 700 Girouard, is the owner and builder of 2 residences costing $18,000 on Brillon, between Northcliffe and Marlowe. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting and tiling to be let.

Mde. L. Nantel, 870 St. Catherine E., is the owner and builder of an $8,000 residence on St. Jerome and 5th Ave., Ros. Carpentry, day labor. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let

Excavating work is being done for $28,000 store and flats south west corner Melrose and Sherbrooke. A. Lafortune, 5776 Sherbrooke West is the owner and builder; architect—R. Charbonneau, 194 G. E. Cartier Sq.; millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

W. Bastien, 3626 Henri Julien, is the owner and builder of 2 residences costing $15,000 on St. Denis. between 33rd and 34th Aves. D. Kochenburger, 2739 St. Hubert St., has the contract for roofing. Masonry to be let.

A. Forget, 1337 St. Denis, is the owner and builder of a $7,000 residence near 1358 St. Denis. Masonry, electric,

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

CITY OF MONTREAL

Auto Road Scrapers

Sealed tenders addressed to the Executive Committee and transmitted by registered letter, for the supply and delivery of THREE AUTO ROAD SCRAPERS will be received at the City Hall, provided that such tenders be mailed not later than

October 15th, 1923,

to be opened on the 17th, at noon.

Specifications and form of tenders may be obtained at the office of L. O. PION, Superintendent of Purchases and Sales, 352 DeFleurimont Street, and the necessary information will be given by H. A. TERREAULT, Director of Public Works, City Hall.

RENE BAUSETA,
City Clerk.

City Clerk's Office, City Hall,
Montreal, October 3rd, 1923. 41

Sealed tenders addressed to the undersigned, and endorsed "Tender for harbour improvements at Port Stanley, Ont.," will be received at this office until 12 o'clock noon,

Monday, October 22, 1923,

for harbour improvements, consisting of the construction of an east pier and a sheet pile wall, at Port Stanley, Elgin County, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Royal Bank Building, London, Ont.; Equity Building, Toronto, Ont., and at the Post Office, Port Stanley, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 29, 1923. 40-41

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-42

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Department of Trade and Commerce,
Ottawa, Ontario

GRAIN ELEVATOR AND CONVEYOR GALLERIES AT HALIFAX, N. S.

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tender for Grain Elevator and Conveyor Galleries", will be received at the office of the undersigned until 12 o'clock noon on

Wednesday, November 7th, 1923,

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Deputy Minister of the Department of Trade and Commerce, Ottawa.

Copies of plans and specifications may be obtained on the payment of the sum of $100.00. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for a sum of $50,000, and made payable to the order of the Minister of the Department of Trade and Commerce, must accompany each tender. A like amount of Dominion Bonds, properly assigned to the Minister will be accepted. This sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque or bonds of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
F. C. T. O'HARA,
Deputy Minister.

Department of Tarde and Commerce,
Ottawa, October 5th, 1923. 41

For Sale New 2x4 Spruce For Flooring

Subject to Prior Sale

Approximately 200,000 feet of new 2 x 4 Spruce Lumber. Dressed four sides, chamfered two edged. Suitable for factory floor. We are open to receive offers for the whole or part. The Goodyear Tire & Rubber Co. Ltd., By-product Department. New Toronto, Ont. 38-41

To Heating, Plumbing and Electric Contractors

Sealed tenders marked "Tenders Plumbing and Electric Wiring," addressed to the undersigned, will be received at this Department until the

22nd day of October,

for Heating, Plumbing and Electric Wiring of the Public and Separate Schools at Haileybury.

Plans and specifications to be seen at the office of the Clerk of Works, Public Works Department. Haileybury, and at this Department.

Each tender must be accompanied by an accepted bank cheque payable to the Honourable George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent. of the tender and the bona-fide signatures and addresses of two sureties, or the name of a Guaranty Company, approved by the Department, willing to provide a bond for the due fulfilment of the contract.

The Department is not bound to accept the lowest or any tender.

By Order,
H. F. McNAUGHTEN,
Secretary, Public Works Department, Ontario.
Toronto, October 8th, 1923.

Newspapers publishing this without authority will not be paid for it. 41

Sealed tenders addressed to the undersigned, and endorsed "Tender for Alterations to Postal Station "K", Toronto, Ont.," will be received until 12 o'clock noon,

Tuesday, October 23, 1923,

for alterations to Postal Station "K", Toronto, Ont.

Plans and specifications can be seen and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa. and the Resident Architect, Department of Public Works, General Post Office, Toronto, Ont.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, October 8, 1923. 41-42

Machinery for Sale

20-ton Standard Gauge Industrial Locomotive Crane, mounted on 8 wheel M. C. B. Steel Car, enclosed steel cab, 50 ft. steel boom with 20 ft. extension.

2 - 1-yard clamshell buckets, newly rigged. Boiler, etc., in A1 condition. Box 390, Contract Record, Toronto. 40-43

The Quebec Streams Commission

Proposed Storage Dam at Lake Mitis

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Storage Dam at Lake Mitis," shall be received at the Office of the Quebec Streams' Commission, Parliament Buildings, Quebec, until Twelve noon, on

Wednesday, October 17th, 1923,

Plans and specifications can be seen on or after this date at the Office of the Commission, 59 Notre Dame Street East, Montreal.

Parties tendering shall be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor of the Province of Quebec, which schedule shall form part of the contract.

Tenderers are notified that tenders shall not be considered unless made strictly in accordance with the printed forms.

A cheque accepted by a Canadian Bank for the sum of Twelve Thousand Dollars ($12,000), made payable to the order of the Provincial Treasurer, must accompany each tender, which sum shall be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted. The cheque of the successful tenderer shall be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
J. A. TESSIER,
Chairman.
THE QUEBEC STREAMS COMMISSION,
59 Notre Dame Street East,
Montreal, September 21st, 1923.

Newspapers inserting this advertisement without authority from the Commission will not be paid for it. 41

For Sale—$350.00

One used Concrete Mixer 12 cu. ft. dry capacity. Power tilting drum type, with side loader and gasoline engine thoroughly overhauled. K. W. Lewis, 105 Front St. E., Toronto, Ont. 41-42

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6' 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3,000 pair Blankets.
Cookery Outfit.

Apply to Box 375, Contract Record, Toronto. 37 42

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

For Sale

Model 28 Marion Steam Shovel with clamshell attachment.
1—No. 2 Mitchell Jaw Crusher (new)
Several screen sections, 48" standard Austin screen.
1—2½" Centrifugal Pump.
1—60' H.P. Locomotive type boiler.
1—60' Barber Green Portable Conveyor.

Above equipment may be seen at our quarry at Hagersville, Ontario.
Hagersville Quarries Limited, 4 Flora Street, St Thomas, Ont. 41-43

Residences

(Continued from page 53)

plastering, painting and glazing trades to be let.

J. H. Demers, 566 Marquette, is the owner and builder of 5 residences costing $50,000 on Marquette, between Laurier and St. Gregoire. Brickwork, millwork, roofing, electric, plumbing, heating and plastering to be let.

H. A. Riopel, 1065 Mt. Royal East, is the owner and builder of $10,000 residence on 4th Ave., between Masson and Dandurand. Masonry, roofing, electric, plumbing, heating and plastering to be let.

R. Charbonneau, architect, 194 G. E. Cartier Sq., is preparing plans for 2 residences (4 flats) on Hampton Ave., N.D.G., for Paul Dansereau, 216 Hampton Ave., owner and builder. Work will start in about a week.

Mad. D'Lemoinoge, 1429 Delorimier, is the owner of a $9,000 residence being built on Des Erables near Mt. Royal and Gilford. Roofing, electric, plumbing and plastering to be let.

Mount Dennis, Ont.

Wm. Lumley, north side Mahoney Ave., is the owner of 4 residences being built on Mahoney Ave. Work is being done by his own men.

Outremont, Que.

R. Loyer & Co., 2094 Chateaubriand, are the owners and builders of $15,000 cottage on Davaar, corner Lajoie. Architect, D. Favreau, 6501 Lamothe. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting, glazing and tiling to be let.

D. Abel, 878 McEarchran Ave., is the owner and builder of a $13,000 residence. Architect—S. Frappier, 2238 Park Ave. Masonry, millwork, roofing, electric, plumbing, heating and plastering trades to be let.

Ottawa, Ont.

A. W. Davidson, 254 Cooper St., is the owner and general contractor of $7,000 residence being built on Somerset St. No materials purchased. 9,000 brick and materials for 32 cu. yds. concrete and 1,000 sq. yds. plaster required.

Fryer & Pout, Euclid Ave., are the owners and general contractors of a $7,000 residence on Central Terrace. 2 stories, 26 x 34, stucco and brick veneer construction.

Point Grey, B. C.

Wm. J. Read, 211—15th Ave. W., is the owner and builder of $11,500 residence at 1189 Matthews Ave. 2 stories, 27 x 42, frame and stucco construction. Townely & Matheson, 325 Homer St., Vancouver, are the architects. Electric, plumbing, heating and plastering not let.

Mrs. H. E. Templeton, 1636—13th Ave. W., is the owner and builder of a $6,000 residence at 1525—28th Ave. W. Electric, plumbing, heating, plastering and painting not yet let.

Quebec, Que.

Habitations Manrese Ltee., are the owners and builders of 75 residences costing $375,000, corner Jeanne D'Arc and Dolbeau Sts. 2 stories, 20 x 30, brick veneer construction.

The walls are going up for ten residences costing $45,000 on Monk Ave. Eugene Lemay Ltee., 46 Lasare St., are the owners and builders.

Three Rivers, Que.

Excavating has started for $10,000 tenement on Ste. Angele St. Zephirin Proulx, 314 Ste. Cecile St., is the owner. Work by day labor. Masonry, roofing, electric, plumbing, heating and plastering to be let.

Toronto, Ont.

W. C. Lock, 101 Glenmore Road., is the owner and builder of 1 pair residences north west corner Cairns and Pullen Ave., costing $8,000. Painting, plastering, electric, heating and plumbing to be let.

The walls are going up for $8,500 garage and residence at 561 Durie St. R. C. Sutherland, 717 Annette St., is the owner and builder. Painting, carpentry and masonry, day labor. Tenders being received on hot water heating, electric, plastering and plumbing.

L. J. Lumis, 11 Albermarle Ave., is the owner and builder of 1 pair residences costing $8,000, at 16-18 Hunter Ave. Painting, plastering, electric, heating and plumbing to be let.

Tenders are being received on heating, electric, plastering and plumbing in connection with $7,500 residence and garage east side Thornhill Ave., near Baby Point Road. W. Haydon, 276 Armadale Ave., is the owner and builder.

T. McKissop, Weston, Ont., is the owner and builder of 3 pair residences corner Belsize Dr. and Bayview Ave. Tenders are being received by the owner on excavating (3 houses), concrete cellars, brick and carpentry work. Tenders will be called later for other trades.

H. Chandler, 85 Howard Ave., contemplates building 1 pair residences on north side Daulac Ave., near Moberley Ave., to cost $7,000. 2 stories, shingle and brick construction.

J. Russell, 15 Mendle Ave., contemplates building 1 pair residences on east side West Lynn Ave., near Murdock Ave., to cost $7,000. 2 stories, shingle and brick construction.

The foundations are going in for $7,500 residence on north west corner Helengrove Ave. and Ainsley Ave. Wilfrid Whitten, 2579B Yonge St., is the owner and builder. Masonry day labor. Owner employs regular staff and buys material as required.

C. J. Mountjoy, 500 Annette St., is the owner and builder of an $8,000 residence at 498 Annette St. Painting, plumbing, heating, plastering and electric to be let.

Frank Taylor, 180 Willard Ave., is the owner and builder of a $7,500 bungalow on east side Evans Ave., near Ardagh. Masonry day labor. Painting, plumbing, heating, plastering and electric to be let.

Gaylord & Wood, 58 Eaton Ave., are the owners and builders of a $7,000 bungalow at 174 Brookside Ave. Painting, plumbing, heating, plastering and electric to be let.

Fred K. S. Owens, 1126 Dovercourt Rd., is the owner and builder of 1 pair residences costing $8,000 at 174-6 Prescott Ave. Plastering, painting, electric, heating and plumbing to be let.

Robt. Sharp, 158 Langford Ave., contemplates building 2 residences on west side Glenmount Park Rd., near Burgess Ave. 2 stories, brick construction.

The walls are going up for 2 residences, $5,000 each, north side High St., near Pinewood Ave. T. L. Guy, 487 Clinton St., is the owner and builder. Masonry day labor. Plastering, painting, electric, heating and plumbing to be let.

W. O. McTaggart & Co., 969 Bloor West, are the builders of 1 pair residences on Marchmont Road for Mr. Armstrong, care of builders. Architect —D. H. Burnham, 266 Lauder Ave. Plastering, electric, painting, plumbing and heating to be let. No materials purchased.

Plans are to be prepared at once by D. H. Burnham, 266 Lauder Ave., for store and apartment on south side St. Clair, West of G.T.R. tracks, for Dr. C. H. Avery, 1728a St. Clair West.

F. Cunningham, 2057 Gerrard East, contemplates building 1 pair residences costing $7,500 on east side Malvern Ave. 2 stories, shingle and brick construction.

B. E. Geisel, 70 Bellefair Ave., contemplates building 32 residences, $4,000 each, on east side Kingswood Rd., near Gerrard East. 2 stories, shingle and brick construction.

B. E. Geisel, 70 Bellefair Ave., contemplates building 1 pair residences to cost $7,500 on south side Swanwick, near Malvern Ave. 2 stories, shingle and brick construction.

Work is to start shortly on 1 pair residences costing $8,000, on north side Poulton near Coxwell Ave. J. R. Edwards, 307 Strathmore Blvd., is the owner and builder. Plastering, painting, electric, heating and plumbing to be let.

Dr. C. H. Avery, 1728a St. Clair West, is the owner of a residence and garage being built corner St. Clair and Hallawell Sts. Architect, D. H. Burnham, 266 Lauder Ave. Tenders are being received by the owner for all trades and materials. No material purchased.

Lumly & Fox, 1195 Weston Rd., are the owners and builders of 4 residences $4,000 each, on south side Mahoney Ave., near Weston Rd. Owners employ regular staff.

J. T. Turner, 990 Woodbine Ave., is the owner and builder of 2 pair residences, $7,500 each, on west side Coxwell, below Danforth Ave. No material purchased. Electric, plastering, painting, plumbing and heating trades to be let.

The foundations are in for 1 pair residences costing $7,000, on north side Castlefield Ave., near Rosewell Ave. Godfrey B. Webb, 76 Orchard View Blvd., is the owner and builder. Masonry day labor. Plumbing, plastering, painting, electric and heating to be let by owner.

May Bros., 22 Shannon St., are the owners and builders of 2 pair residences, $6,500 pair, at 2-4-6-8 Brownlow Ave. Masonry day labor. Electric, plastering, painting, plumbing and heating to be let by owners.

Kaplan & Sprachman, 298 Dundas W., are preparing plans for a $20,000 apartment house at 80 Beverley St.; 3 stories, 6 suites, 21 x 70, brick construction.

Windsor, Ont.

Steve Farrell, 77 Moy Ave., contemplates building a $9,000 duplex residence on Ouelette Ave. 2 stories, brick veneer construction. No materials purchased.

Frank Pickells, 1451 Dougall Ave., is the owner and general contractor of $8,000 double residence on Gladstone Ave. Electric, plumbing and plastering to be let. No materials purchased.

CONTRACTS AWARDED

Brantford, Ont.

R. S. Hope, 217 Terrace Hill, Brantford, has the contract for heating in connection with $8,000 residence being built at 186 Dufferin Ave. Electric to be let. Percy Gillingwater, 874 Marlboro St., is the owner and builder.

Blood Indian Reserve, Alta.

The contract for houses and outbuildings to cost $27,000, has been awarded to Bennett & White Construction Co., Ltd., Calgary, Alta.

Halifax, N. S.

Stewart Ford, 125 Preston St., has the general contract for a $7,000 residence on South St., for H. G. Fraser, 51 Sackville St.

Hamilton, Ont.

Witt, Bull & Oxford, 124 Edgemont Ave., are the owners and builders of several residences on Tragina Ave. Electric—Wm. Thornton, 346 Weir Ave.; plumbing — Wm. Newell, James and Augusta Sts.; heating — Chas. Havers, Wentworth, near Cannon St.

Kitchener, Ont.

The following sub-trades have been let on 4 residences, $4,000 each, being built by C. L. Forler, Baden, Ont., for Geo. Berdux, R.R. No. 1, Baden, Ont.: plastering and masonry — Herman Schultz, New Hamburg, Ont.; electric—L. Zinkan, Plattsville, Ont.; plumbing and heating — D. Becker, New Hamburg. No materials purchased.

S. F. Dippel, 36 Pequegnat Ave., has the contract for roofing, and Bierwagen & Son, 113 Waterloo St., the contract for plastering in connection with $25,000 residence being built corner Waller and Agnes Sts. for W. T. Saff, 72 Wilmot St., owner and builder. J. A. Thatcher, 37 Cowan Ave., Toronto, is the architect.

Limoilu, Que.

Habitations Limoilou, Ltee., are the owners of 12 residences being built on Ozanam St., costing $48,000. Work day labor by A. Demers.

Lachine, Que.

H. T. Hunter, 322 Querbes Ave., Outremont, is the general contractor for 1 pair semi-detached residences costing $9,000 on 34th Ave., near G.T.R. A. Wilson & W. D. McLean, 154—34th Ave., are the owners. Millwork, roofing, electric, plumbing, heating, plastering and painting to be let. General contractor buys materials.

London, Ont.

The foundations are going in for 2 residences on Ridout St., costing $13,000. Hyatt Bros., 290 Egerton St., are the owners and general contractors. Brick is being supplied by the Cooksville Shale Brick Co. Work to proceed this fall. Interested in prices on all materials except brick.

Noble & Rich, 247 Queens Ave., have the contract for plumbing and heating, and Commercial Electric Co. the contract for electrical work in connection with $14,000 residence being built on St. James St. for H. Peel, 139 St. James St. R. G. Wilson & Son, 398 Talbot St., have the general contract.

L. Bradshaw, 601 Dufferin Ave., is the general contractor for $8,500 residence being built on Marley Place for L. H. Scandrett. Architect, W. Stuart Pavey, Standard Bank Bldg.; electric—Lavender Electric Co.; plumbing—Allen & Pope; heating—Fleming & Houghby; painting—Moffatt Bros.; masonry—J. A. McDonald, Ailsa Craig, Ont.

J. Moran, 937 Maitland St., is the general contractor for $9,000 residence on Base Line, for T. Evans, 27 Yale St.

Montreal, Que.

Goodwins, Ltd., St. Catherines St. W., have the contract for painting and glazing, and Pilkington Bros., 8 Bushby Lane, the contract for tiling in connection with apartment house being built on Drummond St. H. L. Fetherstonaugh, 85 Osborne St., is the architect. General contractors are Anglin-Norcross, Ltd., 65 Victoria St.

H. Taylor, 2634 Christophe Colomb has the general contract for an $8,500 cottage being built on Dunlop Ave. for Miss Jean, 2384 Jean Mance. Masonry day labor. Roofing, electric, plumbing, heating, plastering and tiling to be let. General contractor buys materials.

The following sub-trades have been let on 2 residences being built on Laurier, near St. Dominique, costing $30,000: masonry—T. Frennette, 615 Gardnier; electric—J. Champagne, 2599 St. Hubert St.; plastering—Lapierre & Frere, 2674 Parthenais. Owner—A. Lemay, 1827 St. Dominique; architect—Z. Trudel, 228 St. Andre; general contractor—J.H.N. Heuteux, 762 Henri Julien.

A. K. Hutchison, 10 Cathcart St., has the general contract for $20,000 residence being built on Courte, between Fort and Chomedy, for J. R. Douglas, Canada Cement Bldg. Roofing, electric, plumbing, heating, plastering, painting, glazing and tiling to be let. Masonry by general contractor who buys materials.

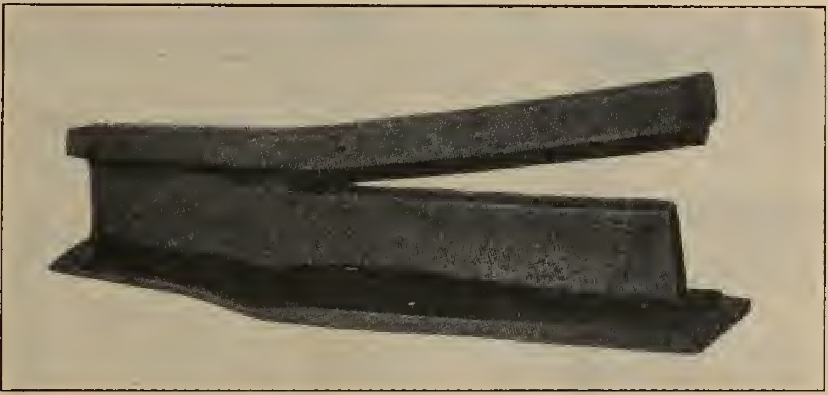
Jos. Paiement, 3488 St. Hubert, has the contract for roofing and plumbing in connection with 2 residences costing $12,000 on St. Gerard, between Villerary and Gounod. J. Pardis, St. Jerome, Que., is the owner and builder. Masonry, painting and glazing—day labor.

The foundations are going in for 2 residences to cost $12,000, on Baby, between St. Urbain and Delage, for L. O. Lamoureux, 633 Rivard. F. X. Morin, 633 Rivard, is the supervisor and buys materials. Roofing, electric, plumbing and plastering to be let.

Work is to start shortly on 12 residences costing $48,000 on Bloomfield corner Lajoie, for E. Lavigne, 412 Wiseman. Architect, R. Charbonneau, 194

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA



"Close-up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.

The Re-rolled Argument

Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.
The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M Specification A-16-14, no undesirable re-rolled material can be substituted.

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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Park G. E. Cartier; general contractor—E. Boissy, 4 Montee du Zouave. Masonry, millwork, roofing, electric, plumbing, heating and plastering to be let.

Moncton, N. B.

Desire Cormier, Sunny Braes, N.B., has the general contract for $8,000 residence being built on Lime St. for R. W. Benjamin, Fourth St., Moncton. Architect, W. C. Barnes, Wyse Bldg. Plumbing—Moncton Plumbing & Supply Co.

Outremont, Que.

The foundations are going in for $11,000 cottage on Courcelette Ave., for E. Johnson, 706 Bloomfield. H. Taylor, 2634 Christophe Colomb, is the general contractor. Masonry day labor by general contractor.

Ottawa, Ont.

The following sub-trades have been let on $7,200 double residence being built on Russell Ave.; electric—Art Davis, Bronson Ave.; plumbing—William Bros., Ottawa E.; heating—Pease Foundry Co.; plastering—W. Skillen, Norris St.; painting—G. Green, Bank and 4th Aves. Cowie & Moore, 414 Sunnyside Ave., are the owners.

Cowie & Moore, 414 Sunnyside St., are the general contractors for $8,000 double residence being built on Russell Ave. for Henry Nitzke, 249 Russell Ave., the owner. Tenders being received by owner until October 15 for electric, plumbing, heating, plastering and painting.

Port Credit, Ont.

The following sub-trades have been let on $7,000 residence being built on Mississauga Road for E. B. Munroe, Mississauga Road: plumbing and heating—J. H. Doughty, Mimico; electric—E. McNeice, Port Credit; painting and plastering (fibre board)—A. McKay, Port Credit. The general contractor is A. E. McKay.

M. Skinner is the owner and general contractor of $6,000 residence on Mineola Road.; plumbing and heating—J. Derry, New Toronto; plastering—A. Reid, Port Credit; painting—A. McKay, Port Credit.

St. Catharines, Ont.

W. W. Park, 49 Queen St., is the builder of $8,000 residence at 8 Centre St. for Carl Ross, 181 St. Paul St. Excavation and masonry—Broom & Chamberlain, 35 Louisa St. Electric, heating, plumbing, plastering, painting, ventilating, sheet metal to be let by general contractor.

St. Laurent, Que.

H. Musy, 330 Fourth Ave., Ros., has the general contract for $10,000 residence being built at 351 Mt. Royal E., for Soeurs Ste. Croix, St. Laurent. Masonry, millwork, roofing, electric, plumbing, heating and plastering to be let. General contractor buys materials.

Stratford, Ont.

Work is now in progress for 20 dwellings to cost $60,000. 8 houses are nearly completed; foundations in on 2 more; roofing and plastering is being done by the owner, Wm. Newman, 55 Cherry St.; heating—Cook & O'Donoghue, 111 Downie St.

Toronto, Ont.

Sub-trades as follows have been let on $7,500 residence being built west side Coxwell Ave., near Queensdale Ave.: plumbing and heating—L. J. Harris, north west corner Coxwell and Poulton Aves.; electric—N. McLeod, 808 Danforth; plastering—W. E. Page, 152 Meagher Ave.; painting—T. E. Davis, cars owner and builder, R. H. Breeze, 280 Glebeholme Ave.

The walls are going up for $12,000 duplex residence at 566 Durie St. General contractor, E. Maxwell, 82 Kenneth Ave; masonry—W. G. Veale & Son, 528 Runnymede Rd.; heating and plumbing—Daniel Glynn, 992 Dundas W.; plastering—John Bradd, 238 Gilmour Ave.; painting—F. Cook, care of builder. Electric to be let.

W. S. Honeycombe, 124 Yarmouth Rd., has the contract for plumbing in connection with $25,000 residence being built on Forest Hill Rd. for H. H. Horsfall, Leaside. Architects are Edwards & Edwards, 18 Toronto St. Heating to be let.

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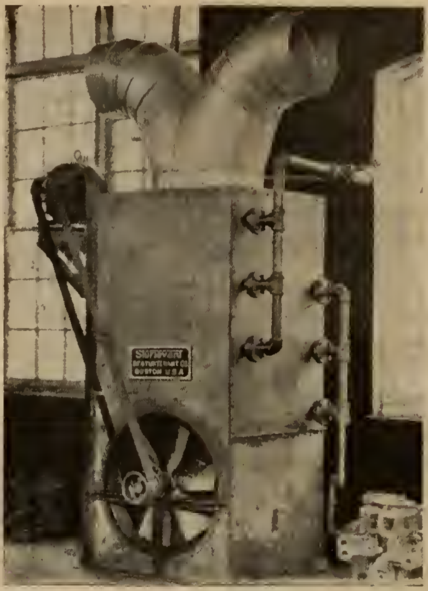

We make six different types of heaters

And each type has a record of highly successful and economical operation in various sizes and types of buildings throughout the country.

All the heating surface of the Sturtevant apparatus is centralized in a single unit and contained in a fireproof jacket—no chance of frozen pipes and no annoying water-hammer racket.

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Saving by Eliminating Needless Variety

As a result of a conference of producers and consumers of asphalt, called in April of this year by the division of Simplified Practice of the Department of Commerce, 88 varieties of asphalt used for paving purposes have been reduced to 9, and 14 kinds employed as fillers for brick and stone blocks have been cut down to 4. Inasmuch as 3 of the grades adopted for fillers are identical with 3 of those recommended for paving, there have actually been eliminated 92 brands of asphalt hitherto on the market.

Just what this will mean to the trade was brought out by one manufacturer, who said: "Had this simplification been effected a year ago (early in 1922), it would have saved our company over $200,000." As there are 22 firms within the United States in this business, the saving should be appreciable. The object of the Division of Simplified Practice is to co-operate with various industries in an effort to reduce waste by eliminating superfluous varieties; and from the work already done it would appear that both the manufacturer and the consumer would gain much if other branches of industry were to profit by the service thus rendered by the Government.

Gasholder Welded in England

Electric welding was applied in the reconstruction of a gasholder recently. The original holder, 200 ft. in diameter, and of 3,000,000 cu. ft. capacity, had been destroyed by fire, so that little of its structure could be salvaged. The brick tank, 200 ft. in diameter by 36 ft. deep, and a part of the guide framing could be used, the latter after extensive repairs. The three-lift holder, however, as well as the guides, had to be replaced. The three lifts, ranging from 191 ft. 6 in. to 197 ft. 6 in. in diameter by 34 ft. 9 in. deep, are made of 9/64 and ½ in. steel. All the sheets were connected by welding. The Z-shapped stiffener stays on the inside of the upper lift were also connected and attached by welding. It is reported that although the holder contains more than 20 miles of welded joint, only two or three small leaks were detected on test. Under the circumstances of the work, no definite cost comparison with riveted work could be made, but estimates by an experienced engineer of gas plant construction are quoted to the effect that the labor time amounted to less than half that which would have been required in riveting. The speed of the welding work is given as 15 ft. per hour on overhead and horizontal fillets and 12 ft. per hour on vertical fillets.

Copper Used as a Rope Preservative

Another of the many and constantly increasing uses of copper is for prolonging the life and, therefore, the service of rope and cordage. A newly discovered method of treating rope with a solution of copper is proving effective for protection against mold, rotting, and especially the depredations of marine animal life.

Impregnating the rope with tar does little good, as the pests eat the tar out for a first course and then proceed to devour the fiber, itself. The 20,000 fishermen in this country who are said to use annually 200,000,000 pounds of rope, are substantially benefitted by the discovery.

The Choice of Men Who Know

THE small user of oxygen and dissolved acetylene can take full advantage of Dominion Oxygen Service.

There are many shops where a comparatively small amount of welding and cutting is done. These shops require the same pure oxygen and acetylene in conveniently handled cylinders and the same assurance of being able to receive their supplies promptly as the mills and factories where larger quantities are used.

We give the small order for one or more cylinders the most careful and prompt attention. Cylinders are of uniform size so that shipping becomes simply a matter of "how many?"

With a widely distributed system of plants and warehouses we are in a splendid position to give you a fresh supply when you need it. This enables you to take care of your requirements satisfactorily and economically.

Our prices show a distinct saving. Be convinced by placing your next order with us.

Dominion
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5

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The success of the great business publications of this, or any other country, is entirely due to the fact that big business men **do** read and **do** eagerly follow the progress of their particular industry, or profession, as reflected in their business newspaper.

Labour disputes, industrial trials and merchandising problems can be discussed by business newspapers in a manner not possible in a publication reaching the general public.

Advertisers can point out to the readers of business newspapers, **technical** points of extreme sales value that would hurt sales if advertised in a medium available to the public.

"Every issue in the last quarter century has been of the greatest value to me in my business.
—Merchant Rating $200,000.00

"The information regarding Electric Power Plants is extremely interesting and instructive."
—Prominent City Engineer.

"We wish to compliment you very highly on the subject matter which you have included in this issue."
—$5,000,000 Manufacturer

--- and ten thousand more!

Barrett Specification Roofs

Bonded for 20 and 10 Years

Barrett Specification Bonded Roof on St. Maurice Lumber Company (Canadian International Paper Company) Three Rivers, Que. Roofer: Chas. E. Hamelin, Three Rivers

The concrete roof deck is heavily mopped with a uniform coating of Barrett Specification Pitch.

An Old Adage applied to Roofs—

Canada's industrial leaders adhere strictly to the old adage that in the long run the best is the cheapest. Thus you find all over the Dominion, factories and mills embodying the most approved ideas of design and construction.

And it is eloquent testimony to the proved durability and freedom from repair expense of Barrett Specification Roofs that these roofs cover not only all the buildings of the St. Maurice Lumber Company shown above but also a majority of the permanent flat-roofed industrial buildings of Canada.

While Barrett Specification Type "AA" Roofs are bonded for 20 years only, many roofs of this type are in first class condition after 40 or more years of hard service. Moreover Barrett Specification Roofs are strongly fire-resistant—they take the base rate of fire insurance.

The dependability and economy of Barrett Specification Roofs are due to these four Barrett fundamentals:

1. *The Barrett Specification*—For flat (or nearly flat) roof construction drawn up by Barrett technical men with the cooperation of leading architects, engineers and contractors.
2. *Standardized Materials* — The Barrett Specification prescribes the number of layers of Specification Felt, the amount of Specification Pitch, the top coat of pitch *poured* (not mopped) and finally the wearing surface of firmly embedded gravel or slag.
3. *The Man who lays the Roof*—Only a thoroughly experienced roofing contractor can obtain the bond for the owner of the building.
4. *Barrett Inspection* — Highly trained Barrett technical men are on the job to see that the Barrett Specification is followed in every detail.

There are two types of Barrett Specification Roofs—Type "AA" bonded for 20 years, Type "A" bonded for 10 years. Free copies of The Barrett Specifications will be gladly sent upon request.

Each layer of felt is hermetically sealed to the adjoining layer by the pitch waterproofing. In no spot do the layers of felt touch each other.

Barrett Inspector making "cut-out test" before wearing surface is applied.

Pouring final coat of hot Barrett Specification Pitch and embedding thick wearing surface of gravel or slag.

The Barrett Company
LIMITED
MONTREAL TORONTO WINNIPEG ST. JOHN, N. B. VANCOUVER HALIFAX, N. S.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20

LIME		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65.00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00

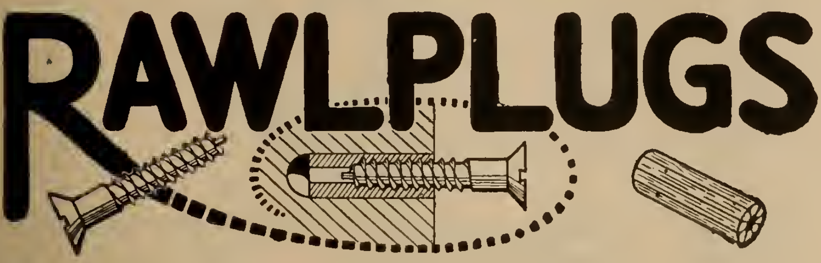
STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50-6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT.—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were advanced recently. New list may be had on application to dealers.
VITRIFIED CLAY PRODUCTS:—*Discount on flue linings is 55%

FIX IT WITH



And Save Time on Every Screw You Use

Most of the leading contractors in Canada are using "RAWLPLUGS" on all their jobs. They do better and neater work, and are a saving in time and labor. "RAWLPLUGS" should always be used when it is necessary to use screws in Marble, Stone, Concrete, Plaster, Slate, Brick, Glass and Tile. No other device offers the same advantages. "RAWLPLUGS" are cheaper to buy and when once in place "stay put."

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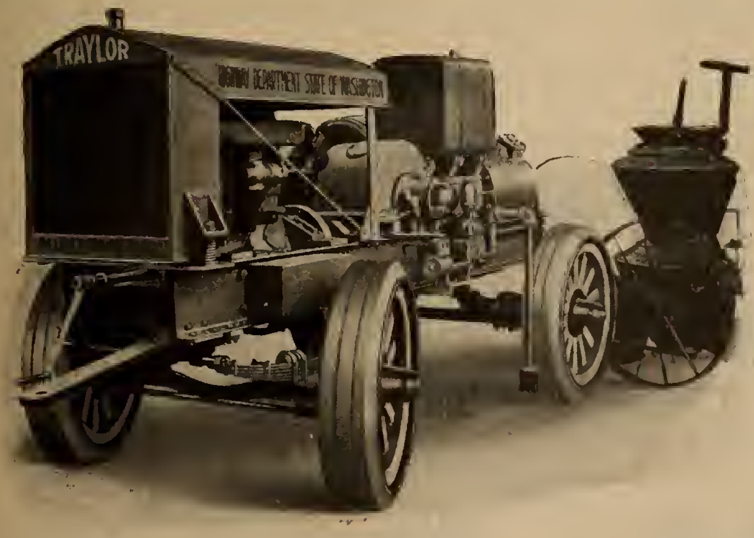
Of course, the new mounting means longer life!

Many a compressing outfit has come to an early grave because the old style mounting permitted it to be jolted to pieces when being moved from job to job.



Made in two sizes. Also mounted on standard iron wheels if desired

Rough going has no terrors for the new Traylor! Its rubber tires, spring mounting and auto type wheels smooth out the bumps and put dollars into the contractor's pockets.

If you haven't got full particulars—write for the bulletins.

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Agents in Eastern Canada:
General Supply Company of Canada,
356 Sparks St., Ottawa
Foreign Agency:
International Cement-Gun Company, Zeist, Holland

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.

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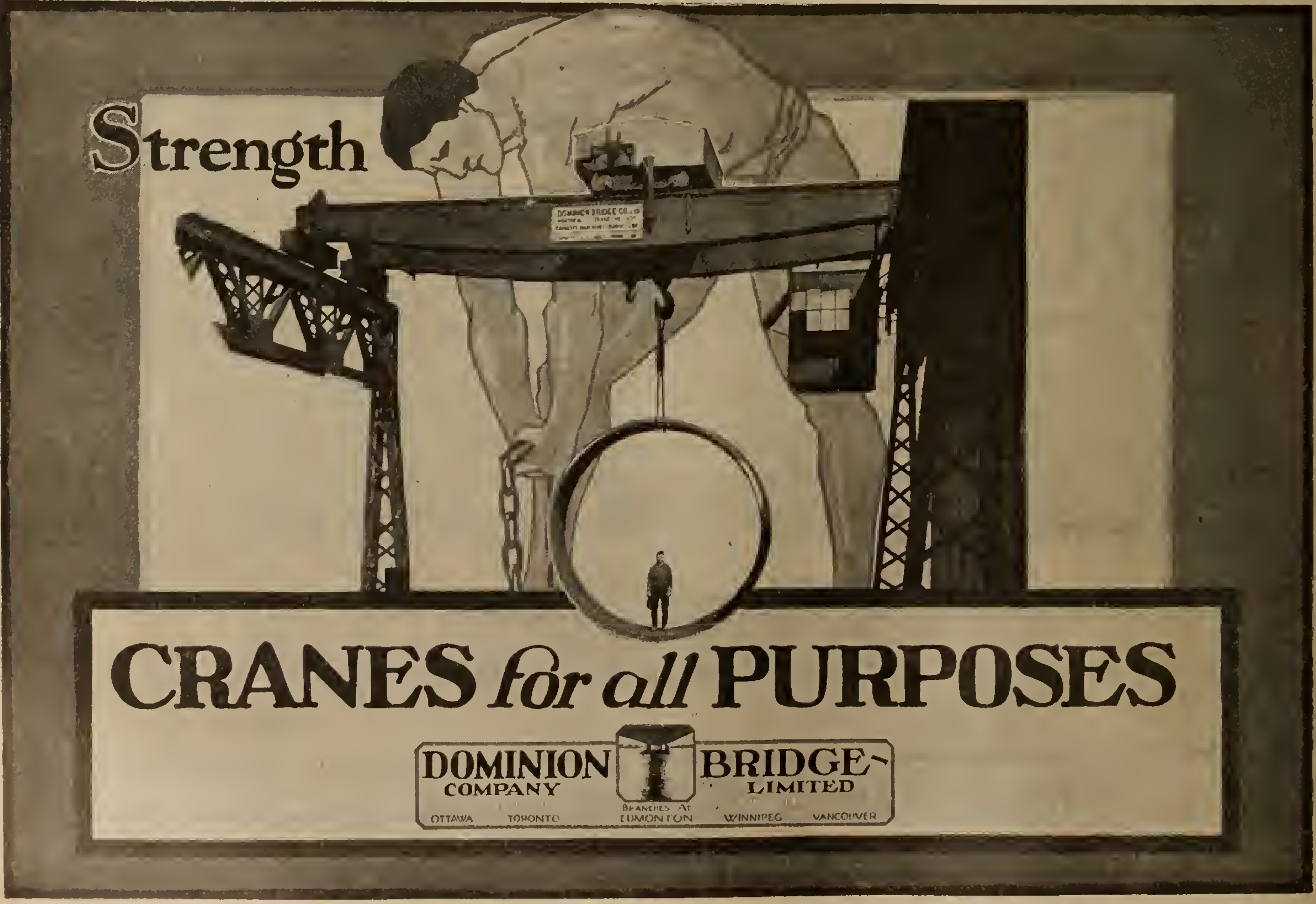

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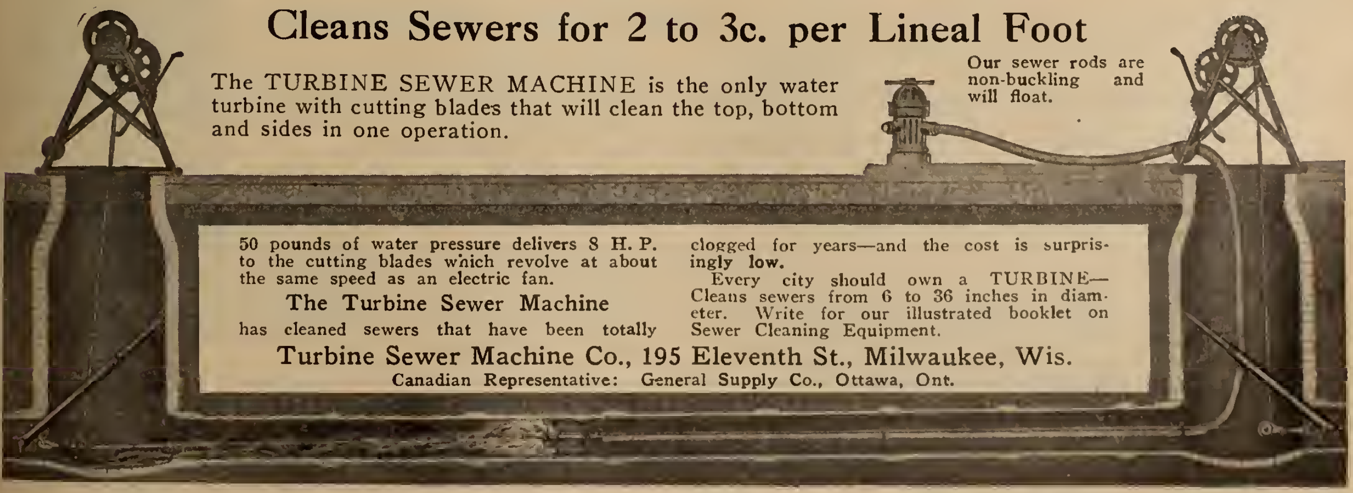

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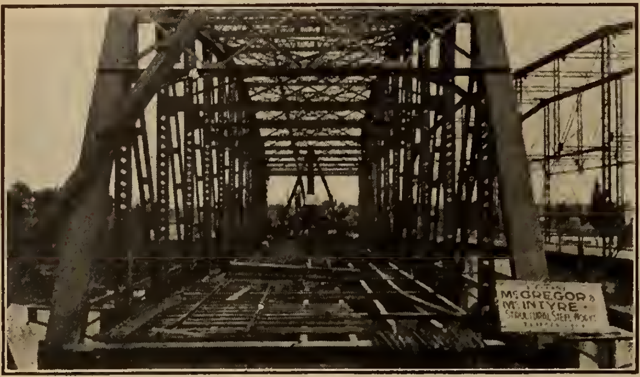

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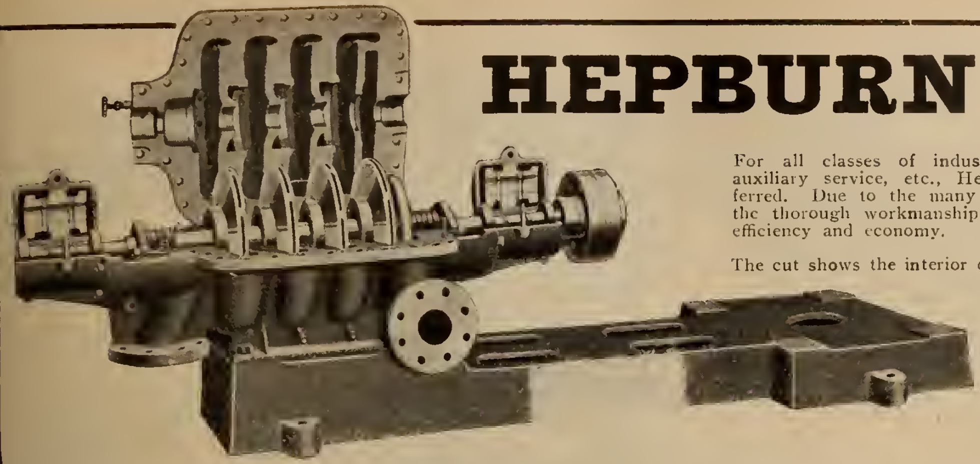

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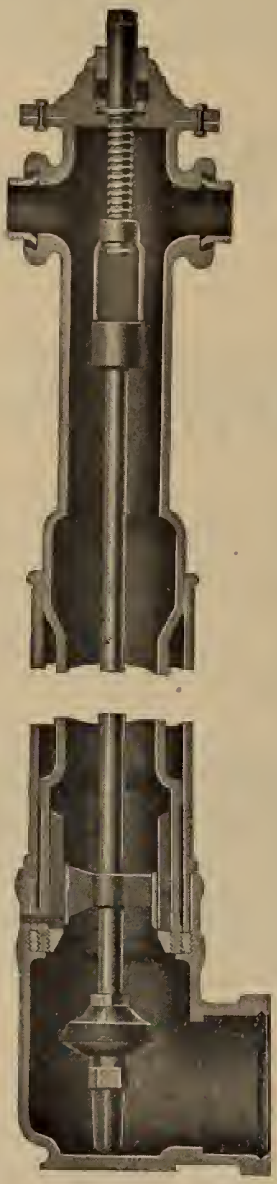

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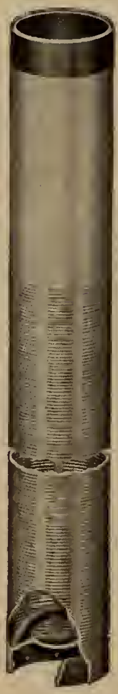

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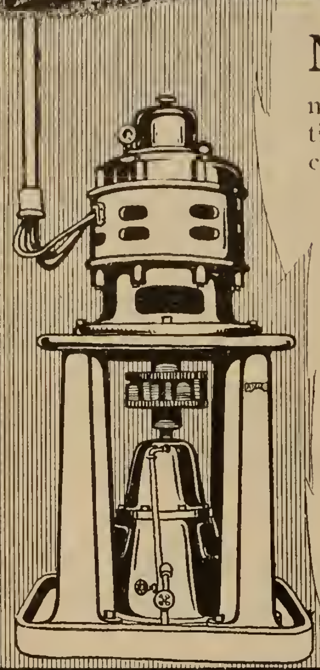

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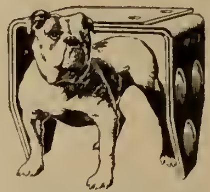

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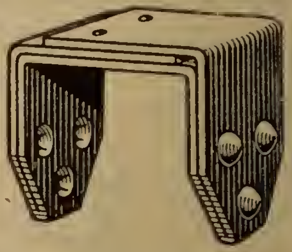

And they asked me how I did it
  And I gave them the Scripture text
"You keep your light so shining
  A little in front o' the next."

They copied all they could follow,
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And I left them sweating and stealing
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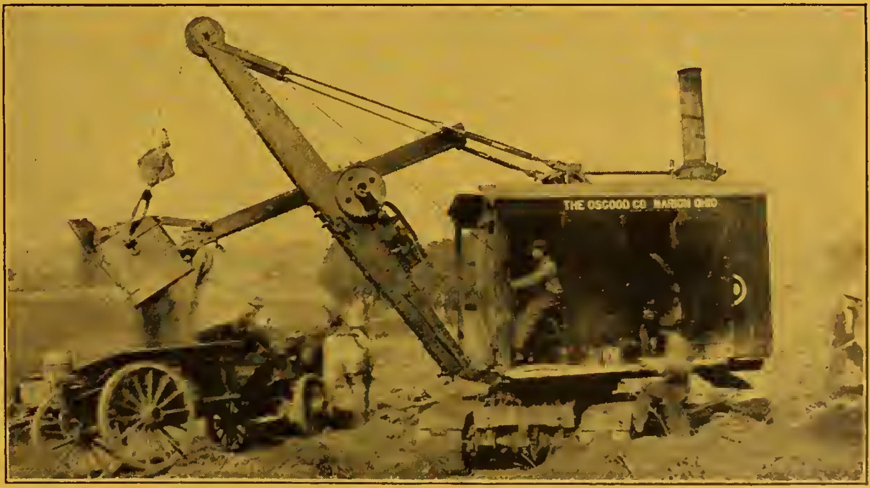

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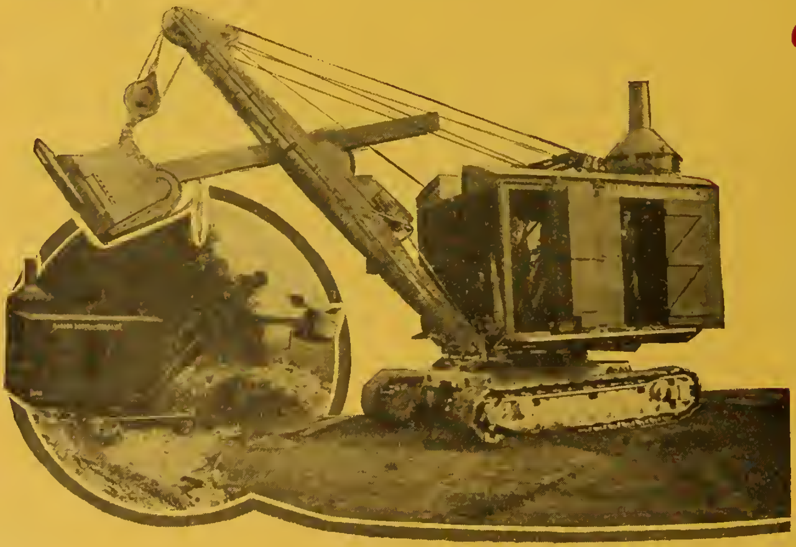

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Vol. 37 Toronto, October 17, 1923 No. 42

Contract Record and Engineering Review

(Above) Yonge Street, south to Langstaff, from Stop 21.

(Right) Yonge Street from Stop 23, looking North to Richmond Hill.

North on Yonge Street

IMPERIAL
Asphalt
PRODUCTS

In keeping with the improvements on other important Ontario highways, considerable new Asphalt construction work has been done this year on the Yonge Street Provincial Highway. Northwards from Thornhill, the Warren Bituminous Paving Company Limited have built some ten miles of Asphalt Pavement (1½" stone-filled Sheet Asphalt, and 1½" Asphalt Binder over a concrete base, using Imperial Asphalt), the work being done for the Department of Public Highways of Ontario.

The daily traffic on Yonge Street is very heavy, embracing as it does every type of vehicle. In addition, very many tourists use this road each summer en route to Lake Simcoe, Muskoka and other holiday districts. The construction of this Asphalt pavement will prove the solution to the problem of building an economical, easily-maintained, enduring road.

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto Canada

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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EFFICIENCY!

Steel
Double-Coupling
eliminates
all leaks

DURABILITY!

Double
Burlap Jacket
secures permanency
in all soils

TWO MILES of GOOD PIPE for the PRICE of ONE

Those who cling to the theory that a combination of efficiency and durability is possible only with Metal Pipe at a fancy price, have not fully investigated the improved standard of Wood Pipe. RESULTS in several Western Municipalities are most convincing.

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CONTINUOUS STAVE PIPE
WOODEN TANKS
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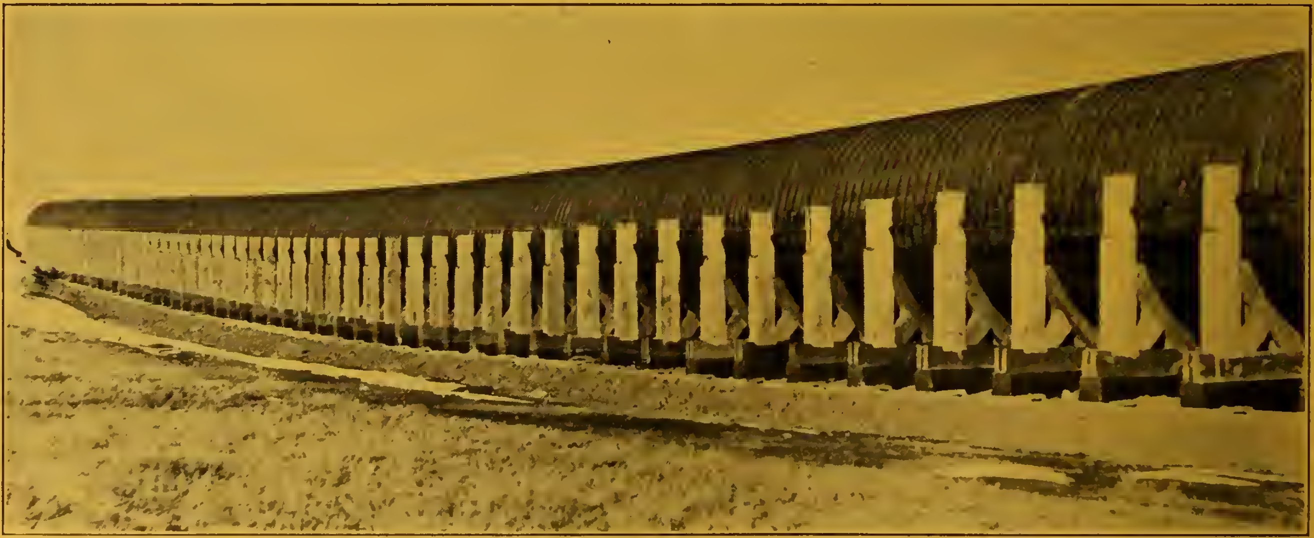

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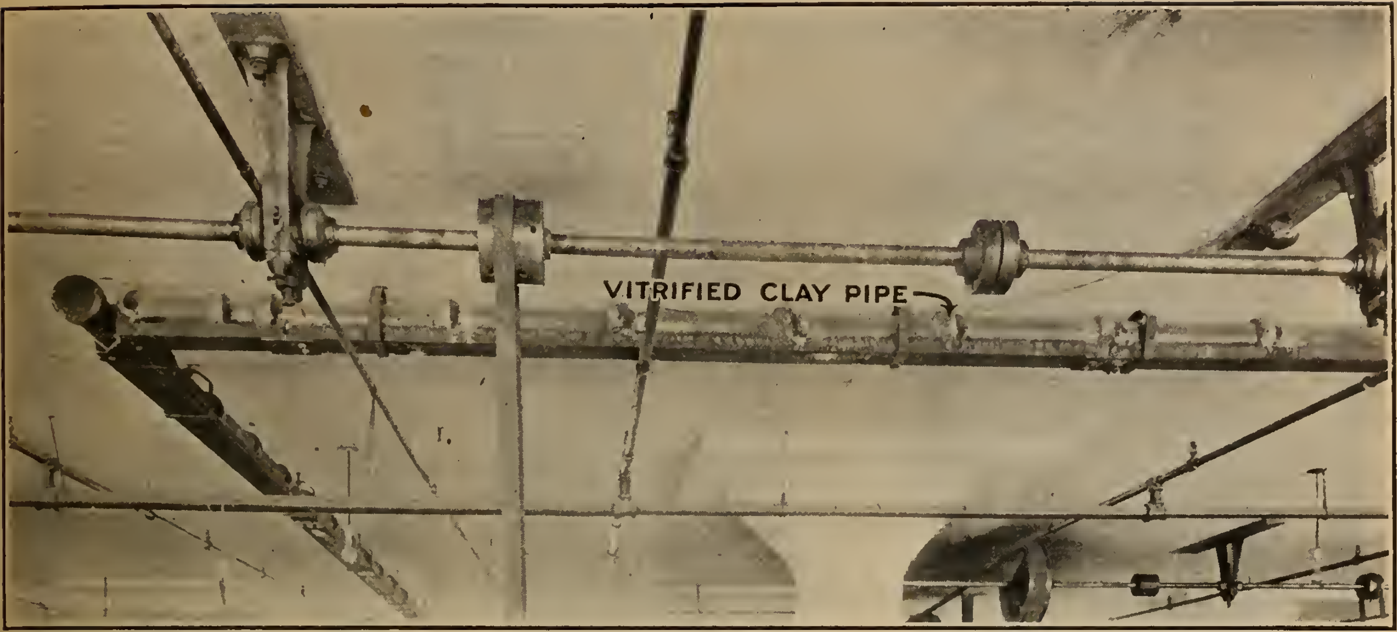
CANADIAN PIPE COMPANY, LIMITED

550 Pacific St., VANCOUVER, B.C.



Suspended from the Ceiling

and down three floors in the elevator shaft of a Toronto Factory a long line of Vitrified Clay Pipe jointed with an Asphalt compound carries strong solutions of—

H_2SO_4 —*Sulphuric Acid*—

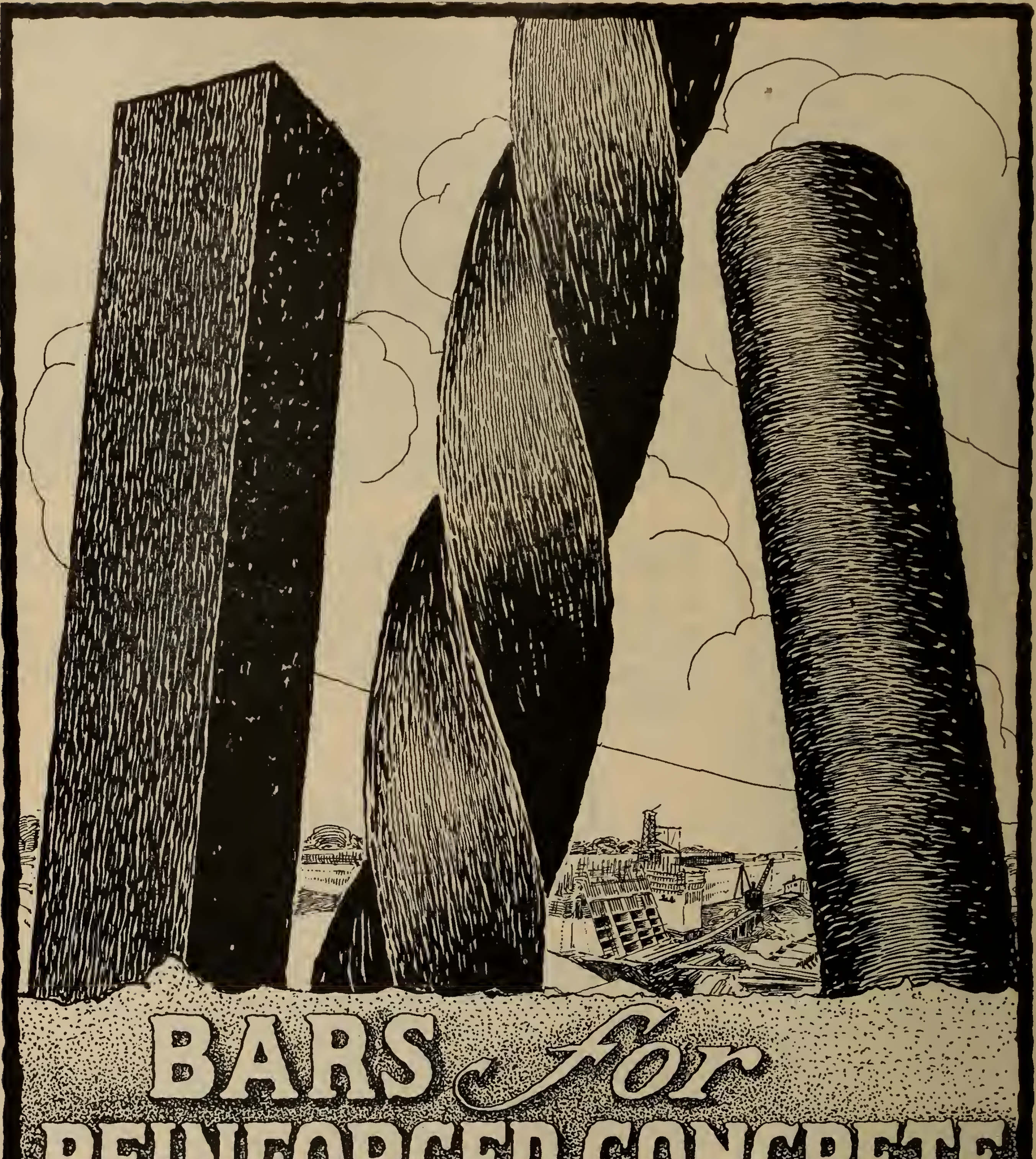
HNO_3 —*Nitric Acid*—

HCl. —*Hydrochloric Acid*—

No metal or concrete pipe would perform this service for a week, but the waste goes without question into the city sewers because they are also constructed of Vitrified Clay Pipe, unaffected by acids or alkalis. Modern industries use great quantities of chemicals and modern sewerage systems to serve these industries without risk of failure must be constructed of

VITRIFIED CLAY PIPE

PERMANENT AS THE PYRAMIDS



Rounds, Squares and Twisted Squares

From Ore to Finished Product - All Within the Empire

BRITISH EMPIRE STEEL
CORPORATION LIMITED
CANADA CEMENT BUILDING MONTREAL, CANADA

Western Representatives, Bissett & Webb, Limited Winnipeg

Insure Your Job with a Thew

When you put in your bid you put up a bond; and when you get it you put up another. These insure the man who lets the job; but who insures you?

You know your own ability and probably that of your organization; but you and your outfit are at the mercy of one thing; and that thing is equipment.

The backbone of that equipment is your shovel. If it lays down on the job, you fail. It stands to reason that you cannot afford to take a chance.

The Thew shovel is not built for the gambler who wants to take long chances. It is the shovel for the man who wants to be in business tomorrow.

This man wants results today and every day, not a few short, snappy records. His operator wants something he can be proud of and brag about.

There are over a hundred good reasons why your shovel should be a Thew. The chief one is its everlasting stick-to-it-iveness. That's insurance enough for you.

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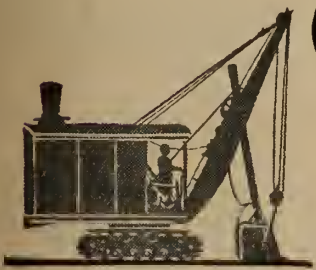
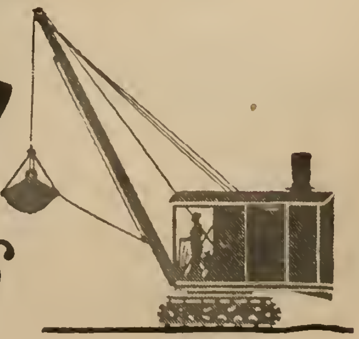


Thew
Power Shovels



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The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

- Acid Proof Fans
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
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The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada
Branch Office, 410 General Assurance Bldg. Toronto, Canada

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Engineers, Manufacturers and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.

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Prompt Delivery

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Toronto, Canada

Adel. 4318 **Adel. 6900**

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  - Canadian Pipe Co.
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  - Vancouver Wood Pipe & Tank Co.
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"Will soon pay for itself"

"I have been grading roads that cost from Seventy-Five Dollars to One Hundred Dollars per mile by contract, and with the Best 'Thirty' they have cost from Twenty Dollars to Twenty-five Dollars per mile in cost of labor, gas and oil. *You can readily see that it will soon pay for itself,*" a County Commissioner in Oklahoma writes.

Investigate the quality of work done and the low costs on other jobs where Best "Thirties" or "Sixties" were used. Write for a list of nearby owners.

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BEST TRACTORS

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  - Can. Fairbanks-Morse Co., Ltd.
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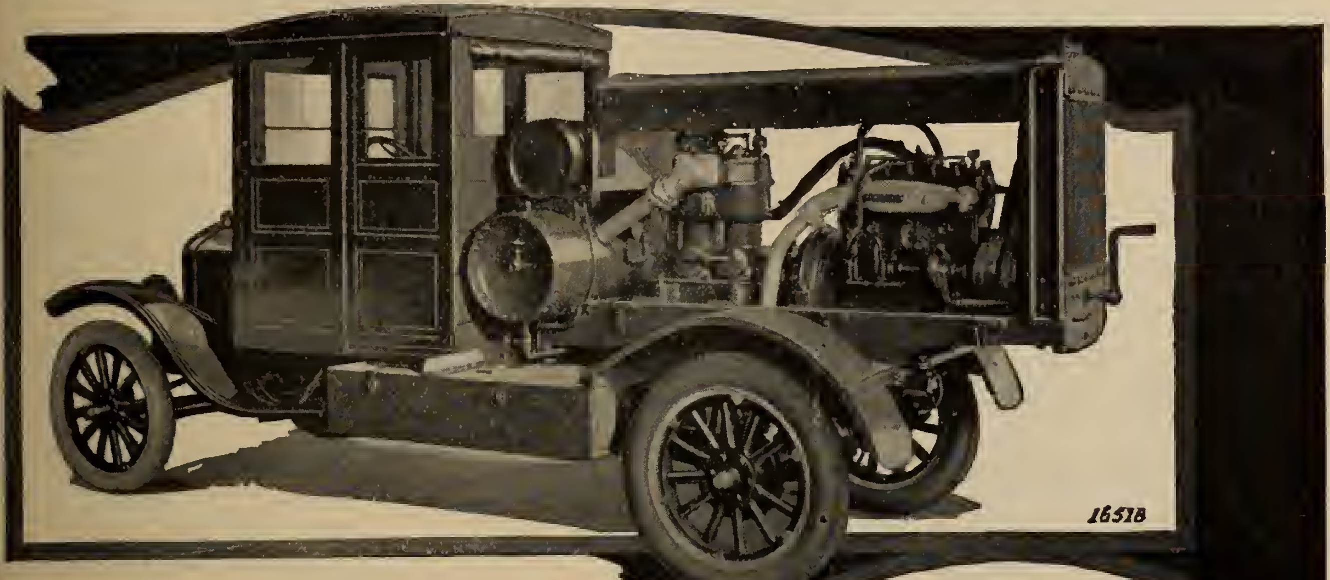

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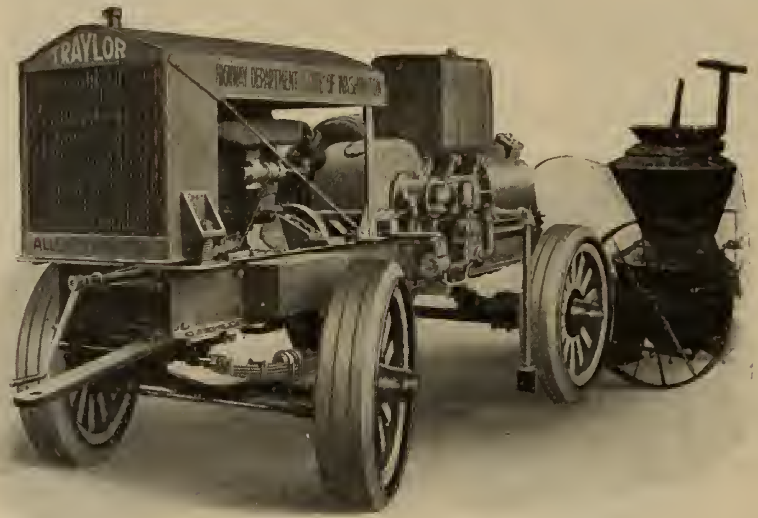

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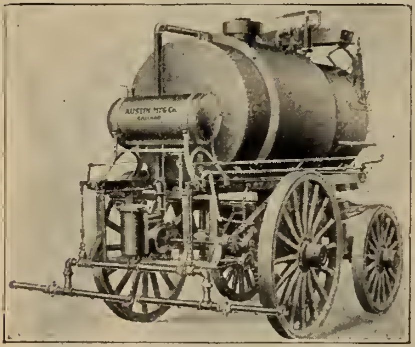

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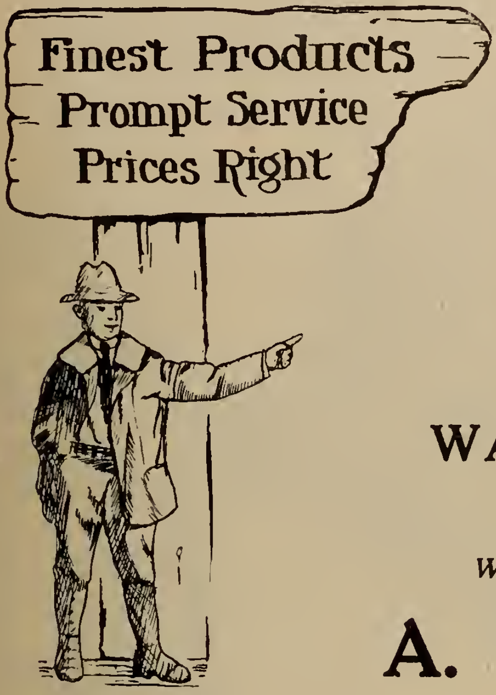

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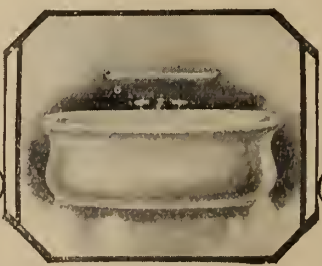

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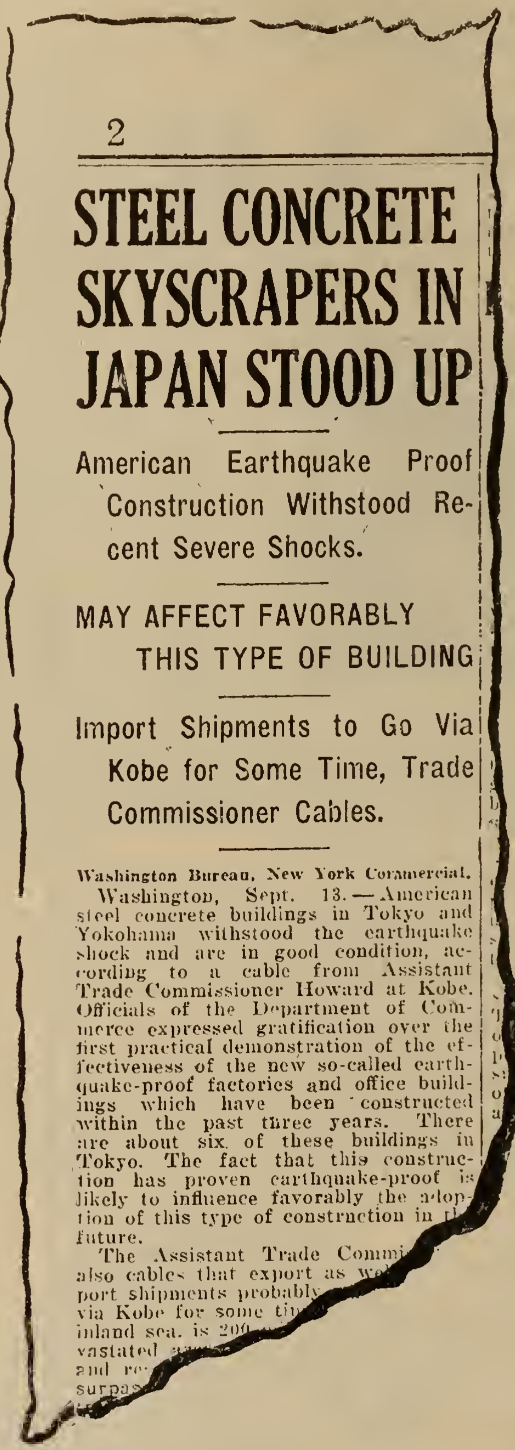

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American Earthquake Proof Construction Withstood Recent Severe Shocks.

MAY AFFECT FAVORABLY THIS TYPE OF BUILDING

Import Shipments to Go Via Kobe for Some Time, Trade Commissioner Cables.

Washington Bureau, New York Commercial.

Washington, Sept. 13.—American steel concrete buildings in Tokyo and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner Howard at Kobe. Officials of the Department of Commerce expressed gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokyo. The fact that this construction has proven earthquake-proof is likely to influence favorably the adoption of this type of construction in th
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They stand to-day, in a sea of ruin, monuments to the indestructibility of Concrete construction, justifying the foresight of the men who built them.

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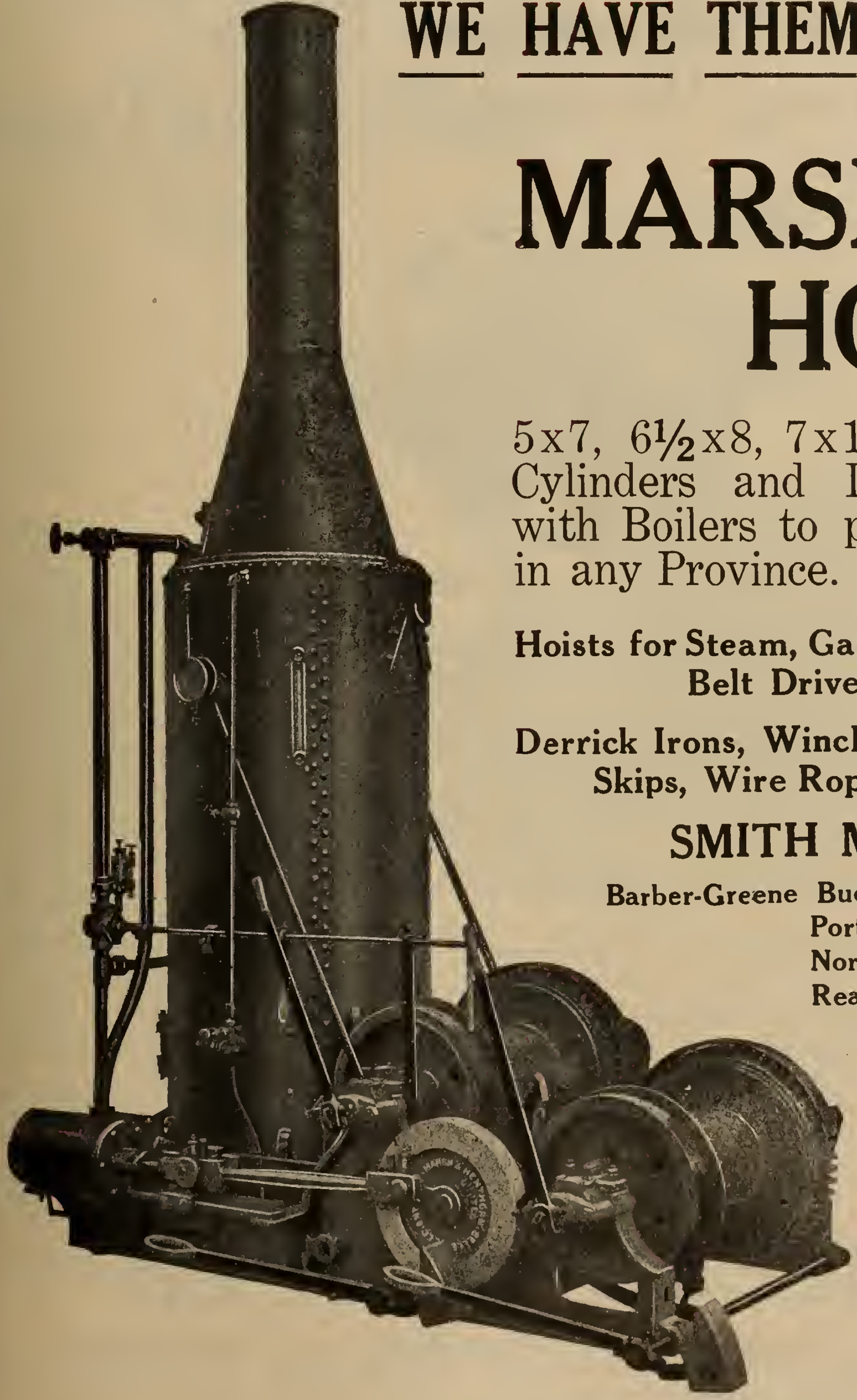

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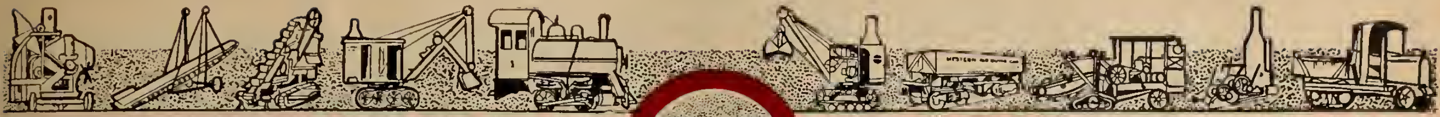

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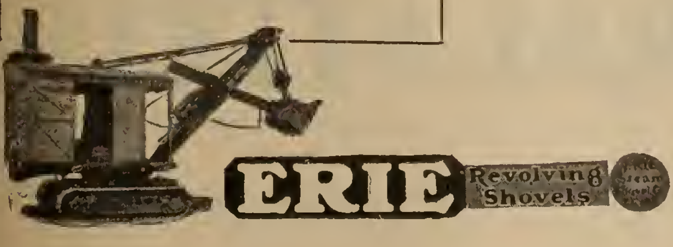

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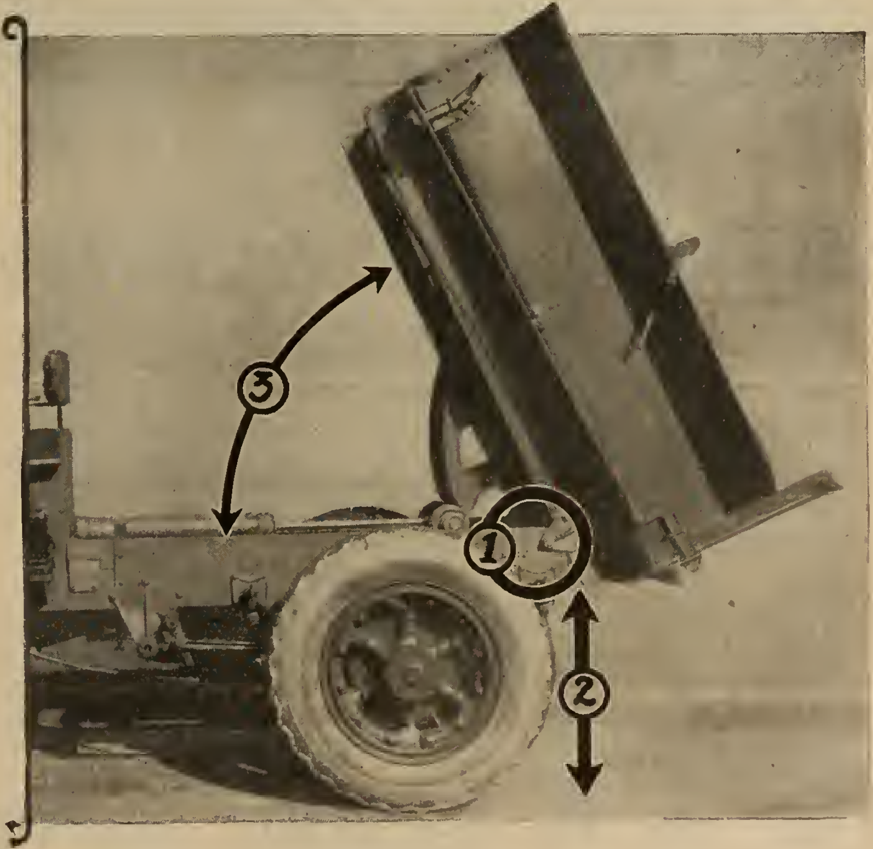

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German Competition

Germany is grappling with the eight-hour day—throttling it. The fight has seen the fall of the government and its return to power on the distinct understanding that the eight-hour day is a thing of the past. The industrialists of Germany are insistent. It's a matter of life and death, they say.

Canada will do well to consider the effect of the movement. German competition is already with us. The worthlessness of its currency enables Germany already to undersell local manufacture. What will be the effect of a ten-hour day? Can we continue on the old basis? Can Canada, working eight hours a day, paying high wages, and taking things easy at that, compete with ten hours a day, starvation wages and intense concentration?

The influence that Germany is certain to exert on the rest of the world is not pleasant to contemplate, but there is no use sticking our heads in the sand. There is only one way to meet this competition—greater efficiency. We hope it will mean longer hours in Canada, or reduced wages, but there is no shadow of doubt that it means harder work, more brains, better organization. The years ahead of us are certain to be strenuous ones and in such times the fittest only survive. We do not want to beat Germany with her own weapons. The competition must be won by superior organization, superior intelligence and an industry that is not of the machine type.

Employment is Better Than Doles

Cities and other municipalities have within their power one means of helping to overcome the seasonal nature of construction, namely, the awarding of contracts for municipal work at such a time as to enable the projects to proceed during the winter months. Of course, every kind of municipal construction does not lend itself to winter handling but there is always an abundance of work of one kind or another, coming under the direction of the municipal works department, that could, with the exercise of foresight, be carried on not only safely but with efficiency and oftentimes at a lower cost. Take sewer work, for example. In how many cases—the great majority of cases, as a matter of fact—do city engineers sanction projects of this character only for summer construction! Winter, as far as this class of work is concerned, and many others too, is a season of idleness.

What is the remedy? Just simply the realization that low temperature need not be a retardant to many classes of public construction undertakings; a recognition of the fact that, as experience has frequently demonstrated, work may be as safely carried out during the winter months as in summer with only the need of exercising ordinary prudence and precaution. To be specific again, sewer construction especially in tunnel, need rarely be interfered with by cold weather. Workmen can work as comfortably below the frost line in winter as in summer, while surface workers can be given suitable protection at not unreasonable cost. Even open-cut construction can be handled without a great deal of discomfort on the part of the workers and without any abnormal increase in cost or decrease in efficiency. Most of those cities that have had any experience in the carrying out of sewer construction in the winter time have satisfied themselves that the policy is worth while.

While sewer construction has been taken as an illustration, many other types of public work lend themselves to similar consideration. Of course, snow, if in abundant quantities, will interfere with road work, but under certain circumstances, even paving may safely be carried out.

If only as a means of reducing unemployment, municipalities should be ready to undertake more winter work in the manner suggested. The class of labor involved in public construction undertakings is largely of the unskilled type, and these are the men who form the bulk of the unemployed in the winter time. By giving them work, the kind of relief that they desire will be provided, while at the same time

No. 103

Canada's Engineers—Prof. Chas. A. Robb

Professor Charles A. Robb, M.E.I.C., who is this year's president of the Association of Professional Engineers of Alberta, was born at Amherst, N.S., in 1888. After taking two years—1905 to 1907—in applied science at Mount Allison University, he went to McGill University, Montreal, and graduated with degree of B.Sc. in mechanical engineering in 1909. A year later he received the master of science degree at the Massachusetts Institute of Technology.

Prof. Robb's early shop experience was obtained at the Robb Engineering Works at Amherst, N.S., and after graduation, with the Allis-Chalmers Co. at their West Allis works. During 1911 and 1912 he was assistant in mechanical engineering at the Massachusetts Institute of Technology under Prof. E. F. Miller. To date he has been with the University of Alberta in capacities varying from lecturer in mechanical engineering to professor of mechanical engineering and resident engineer.

During the war period Prof. Robb was employed by the Imperial Munitions Board, Ottawa, as superintendent of gauge production in 1916 and 1917 and as technical assistant to the representative of Imperial Munitions Board at Washington during 1918.

Prof. Robb joined the Engineering Institute of Canada in 1908 as a student member, becoming a member in 1923. He was a member of the E.I.C. fuel committee in 1923. He is also an associate member of the A.S.M.E. and a member of the Alberta Association of Professional Engineers, being president of this association for 1923.

During the past three seasons he has been engaged for the Air Research Committee of the Honorary Advisory Council for Scientific and Industrial Research on behalf of the Air Board upon the investigation of problems involved in the operation of aero engines at low temperatures, including starting, lubrication, performance of the carburetor and anti-freeze mixtures. He was elected as an associate of the committee in 1921. Since 1920 he has conducted steaming trials on various Alberta Coals as part of the programme of the Alberta Provincial Research Council. In 1923 he was authorized by this Council to consult with the principal combustion engineers of the Province to deal with the problem of combustion of coal for the generation of power with special reference to Alberta Coals.

Prof. Chas. A. Robb

the city will be having necessary public projects carried out. The lower wages often prevalent in the winter time will keep the cost within reasonable bounds by offsetting any increase that may be occasioned by frozen ground, the need of additional protection, heating of materials, etc. Let more cities try this plan this coming winter and thus remove the bugbear that seems to be attached to winter construction. The relief of unemployment alone will justify a trial.

Summary of the Trade of Canada for August, 1923

The summary of the trade of Canada for August, 1923, the latest figures available, shows that as represented in dollars, imports for consumption were valued at $78,825,677 in August, 1923, as against $67,354,750 in August, 1922, and $65,147,301 in August, 1921. The imports from the United Kingdom in August, 1923, were valued at $12,945,459, as against $12,351,408 in August, 1922, and $7,897,695 in August, 1921. The imports from the United States in August, 1923, were valued at $54,383,868, as against $43,602,267 in August, 1922, and $46,063,817 in August, 1921. The total imports for the twelve months ending August, 1923, were valued at $392,979,117 as against $303,597,326 for the corresponding period in 1921-22, and $319,009,763 for the twelve months ending July, 1921.

The value of the exports of Canadian produce for the month of August, 1923, was $80,021,409, as against $73,386,199 in August, 1922, and $61,485,993 in August, 1921. The exports to the United Kingdom were valued at $25,033,604 in August, 1923, as compared with $29,932,623 in August, 1922, and $23,501,013 in August, 1921. The exports to the United States were valued at $36,767,444 in August, 1923, as against $31,687,524 in August, 1922, and $24,169,908 in the corresponding month of 1921. The value of the total exports of Canadian produce during the twelve months ending August, 1923, was $1,001,037,574, as against $779,467,399 for the corresponding period in 1921-22, and $1,012,187,163 for the twelve months ending August, 1921.

The month's returns show a favorable balance of trade of $1,195,732, the returns for the twelve months' period show a favorable balance of $109,146,539.

The Toronto Branch of the Engineering Institute Hears Thoughtful Address on the

Engineer's Relation to Industrial Problems

The Profession Has an Important Responsibility in Helping to Cure the Unrest and Disorganization that Characterize Industry Today—The Need of Research Demands Engineering Co-operation

In resuming its activities for the 1923-24 season, the Toronto Branch of the Engineering Institute of Canada inaugurated a somewhat new policy by holding a luncheon meeting at the King Edward Hotel on October 12. It is stated that this will be but the first of a number of similar meetings that will be scheduled during the next few months. Heretofore, the meetings of the Toronto branch have, almost without exception, been evening sessions.

For the meeting of October 12, the Committees of Publicity and Arrangement, as well as the chairman of the Branch, Prof. C. R. Young, had worked hard to secure a large attendance to hear the speaker, Mr. E. J. Mehren, vice-president of McGraw-Hill Company, Inc., New York, and editor-in-chief of Engineering News Record. The result was that a large and representative gathering of Toronto engineers paid tribute to Mr. Mehren's work in the field of technical publishing. After a preliminary address by J. C. Keith, chief engineer of the Essex Border Utilities Commission, and secretary of the Windsor Branch E.I.C., Mr. Mehren addressed the meeting on two closely allied topics: The Research Activities of the Engineer, and the Engineer's Relationship to Industrial Problems. His address is printed herewith, almost in full:

I cannot be presumed to know Canadian conditions well. Consequently, I must select for discussion engineering problems that are of such fundamental importance that they are as certain to have an interest on this side of the line as south of it.

There are many such subjects, but I have selected only two and even these for only brief discussion. The first is the problem of research, and the second the engineer's professional relation to certain of the outstanding industrial problems of the day.

Research

It is not necessary to argue before a body of engineers upon the necessity for research work. We are all profoundly impressed by the relation which research holds to all technical progress. We readily agree that there is no finality in engineering development. No matter how far we may go, there will still remain uncharted areas of engineering knowledge. Indeed, it is upon this theory that our profession rests, for it is our task to turn forces and materials to the use of man. We shall not be able to discharge our task unless, in the face of exhausting natural resources, we discover new forces or more efficient ways of utilizing the known ones, and unless we wring new values from the lean ores and deposits upon which we are being thrown to a greater extent year by year. In scientific and engineering research is our only hope. My word to you today is that the engineer, who believes in the possibilities of research, should not merely accept this instrument passively but should be an active propagandist for its general acceptance by industry.

Such researches as have been made, in the United States at least, have come because of the vision of a very few men, forced oftentimes by industrial necessity. As a consequence, though there is in the aggregate a large amount of research work under way south of the international border, the sum total of problems being explored is relatively small when we visualize the extent of our industry as a whole. Only a few industries are imbued with the research idea. Only a few realize that rule-of-thumb experimentation by rule-of-thumb men is an instrumentality of a past industrial age and that the modern industrial tool for solving technical problems is scientific research carried on by competent investigators.

Examples of Successful Research

Our propaganda needs to be directed particularly at industrial leaders. They cannot be expected to have for it the burning ardor that we should possess. It is for us who understand the tool to advocate its employment and to point out its possibilities in our individual industries. We need to be fortified by examples of successful research work, such as is represented by the present high development of the tungsten-filament and nitrogen-filled incandescent lamps; the loading coils which make possible long distance telephony; the marvelous inventions which have made radio a matter of every-day pleasure and convenience; the metallurgical processes which have made useful low-grade ores that were worthless a few years ago; the studies which have given to the baking industry two radically new and profitable processes, salt rising bread and the vitamin extract for making white bread a thoroughly balanced food; the researches which have resulted in the production of new materials, such as bakelite (one of the synthetic resins), of carborundum, of electric furnace graphite and a hundred other new chemical compounds. We need, too, to show that the automobile industry is built on the research laboratory, for metallurgical research discovered and perfected the high-grade alloys which have made possible the light-weight serviceable car of the present day.

With such an equipment of knowledge regarding successful research work we can carry to industry the conviction that this new tool deserves to replace the old tool of rule-of-thumb experimentation by rule-of-thumb men. There has never been difficulty, either in Canada or in the United States, in convincing industrial leaders that they should discard antiquated equipment when newer devices were developed that would show it to be profitable to scrap the old equipment. The same argument needs to be applied to research work. We must advocate it as a modern tool productive of greater economies than an earlier tool whose discarding we recommend.

For Canada, I should think that researches into the use of timber and the recovery of metals from ore should be particularly desirable and profitable. In your immense pre-Cambrian shield are great timber and ore resources. In fact, except for a small percentage of this area where agriculture is profitable, timber and metals constitute the only resources of this area. To make it serve in building up Canada is surely a project worthy of the best endeavor of Canadians, either as individuals, through their associations or through their government.

Difficulties Can be Overcome

There are, of course, difficulties in the way of extensive research work. There is, first of all, cost. Good research work is not cheap. And there is, second, the difficulty of obtaining competent investigators. But there are ways of meeting these difficulties. When independent research has been too costly, some industries have found it profitable to associate themselves into a co-operative group for the conduct of research work, the cost being borne by all parties to the agreement. Further, our universities have found it desirable to allow their research facilities to be used in studying industrial problems under a variety of arrangements sufficiently broad to meet almost any situation as to cost of work and engagement of competent investigators.

Obviously we cannot let this broad advocacy of industrial research lie with the engineer solely as an individual. He needs to have the backing of the profession. Here in Canada you have a research comcil, sister to those in Great Britain and in the United States. Such a body should be an important adjunct in our progaganda work. Our engineering societies need to have strong research committees, oftentimes represented by sub-committees in important local branches.

Back of all our efforts to sperad the research idea must be our universities. Our young men must come out of college thoroughly imbued with the belief that no matter in what branch of engineering they may be engaged there is opportunity for inquiry as to improvement of methods and processes, as to the fundamental laws of physics and chemistry and mechanics which underlie the processes or the structures of their industry. It is not expected that in their student days they will contribute much to the sum total of human knowledge. But they can be surrounded by a certain amount of research work. The spirit of inquiry must be in university atmosphere. Competent researchers must be at work, giving tone to the engineering faculty and inspiring young men by their adventures and explorations in the unknown regions of human knowledge.

With our research work well carried on in our engineering colleges, with research committees in our national engineering societies, with a constant fostering of the research idea by those engineering committees and a full confidence and belief by the individual engineer in the potency of research, we shall succeed in carrying our message to industrial leaders and securing for engineering inquiry the resources in money and personnel which are necessary to deepen our knowledge of engineering laws and convert this knowledge to the convenience and the comfort of man.

So much on the subject of research. Let us turn briefly to some of the industrial problems of the day.

No well-informed member of a great democracy can be callous to the industrial difficulties of the day. We have seen prices rise abnormally, we know that industrial efficiency has declined, we feel that there is less sympathy now between employer and employed than there was ten years ago.

The outlook is, indeed, discouraging. The market for products is being cut down by high selling prices, the industrial machine functions badly because of internal maladjustment.

Every well-informed man, I have said, must be concerned over such an industrial situation. But the engineer has not merely the concern of every member of the community, but a professional responsibility as well. More than any other class he is responsible for the basic industrial order of the day. It was through his discovery of the uses of power and through his elaboration of machinery that it was possible to create our present industrial structure, with its massed production units. Viewed from that aspect the engineer has a heavy responsibility. Moreover, as the one professional element that is part and parcel of the industrial structure the public has a right to look to him for special activity in finding a solution.

There are two problems: first, to devise new and better production methods, new processes, simpler and cheaper products, and second, to work to a sympathetic understanding betwen worker and management and investor of their mutuality of interest. The solution of both parts of the problem, or even partial solutions of them will make for higher production and lower selling costs.

It is obvious, of course, that no one group of men alone can solve both problems or either of them. But if the engineer cannot shoulder the whole responsibility certainly his intimate contact with industrial functioning and his trained method inquiry should enable him to bring rather a larger influence upon the solutions than that of any other class in the community.

Engineers Are Active in Taking Up Question

Already engineers have shown that they are not indifferent to this professional responsibility. Through such men as Frederick W. Taylor, Henry L. Gantt, and Harrington Emerson in the United States, they have shown that it is possible to introduce into management mechanisms that make for greater industrial efficiency with greater satisfaction to workers, to management and to the shareholders. Valuable, indeed, has been this contribution of engineering thinking to industrial functioning. Recently, engineers in the United States have, in an organized way, under the direction of Mr. Hoover, made a broad study of the possibility of eliminating wastes in industry and of the eight-hour day in the steel mills. They are actively participating, through various committees, in production economies by eliminating excess varieties of products. Moreover, the research work of which I have spoken contributes to the solution of this phase of the industrial problem.

But this problem has had extensive discussion at the hands of engineers. Let us turn to the second problem, which is one of human relations.

It is patent that there needs be developed a greater community of interest between the three elements of our industrial fabric—the worker, the management and the investors. In the development of such a community of interest the engineer, trained to take a judicial attitude, should bear an important part. I have no panacea to suggest, no method to offer that will assuredly bring home to all parties this essential community of interest. But I do want to recite to you briefly a plan now in its experimental stages in the United States, which may have applicability to Canada or at the very least may stimulate you to some further thinking on the subject.

It is notorious that in the United States the building construction industry functions badly. Strikes are of frequent occurrence. Efficiency has greatly declined. The wages, according to the man in the street, are exorbitant; certainly they are out of line with those paid right now in most of our industries. In consequence, the cost of building is high.

Obviously the true cure can come only from within. Realizing this a group of far-sighted men in the building industry in New York, headed by a number of architects, considered whether it was not possible to erect within the building industry itself a conference group that would face clearly the difficulties affecting the industry and attempt to work out their solution. In consequence there was formed about three years ago the so-called New York Building Congress. In it is represented every branch of the building industry—the owning interests, represented by the real estate men, the architects, the engineers, the general contractors, the sub-contractors, the material dealers and building labor. One must expect that the progress of such an organization will be slow, for the first essential of accomplishment is that there should become established between all branches of the industry a confidence in one another. I do not believe that the officers of the New York Building Congress would claim that they have made extraordinary progress. Their specific accomplishments to date are relatively few, but there is an intangible but nevertheless very valuable base for further work in the confidence developed between all parties.

A Basis of Apprenticeship

The most notable accomplishment to date has been the organization of the apprenticeship work. It was fully realized before the Congress came into existence that there was a great shortage of competent building mechanics. The public generally, and to some extent the industry, laid the blame for the shortage upon the labor organizations. It was stated that they restricted the number of apprentices and thus prevented the rapid recruitment of their ranks. The New York Apprenticeship Commission, under the auspices of the New York Building Congress, was formed and consists of representatives of the contractors, the engineers, the architects and of building labor. It was found that the labor organizations were most anxious to establish proper apprenticeship schools and to develop a thoroughgoing apprenticeship system. Studies soon indicated that the labor unions were not at fault for the small number of apprentices, but the employers. It is true that the unions did have restrictions, and have them now, as to the number of apprentices that may be employed, but excepting in two of the trades there were in actual service in the industry only from 30 to 40 per cent. of the number of apprentices permitted under labor union regulations. The reason for the shortage was almost entirely that the contractors were unwilling to take the trouble to train young men—one of the biggest tasks of the New York apprenticeship Commission has been to get the contractors to take all of the apprentices that union rules will permit.

A second difficulty, but a minor one, was that there was no place to which a young man not having acquaintance with a contractor or a labor union leader could go and enroll as an apprentice. The Apprenticeship Commission is now a clearing house for all young men wanting to enter the building trade and makes it its business to find assignments for them. As a result of about two years' work the number of apprentices now indentured and under instruction in the city of New York has been increased from 200 to 2,100. Not only has there been the heartiest co-operation of the labor unions but the Board of Education of the City of New York, realizing its obligation to train young men in whatever vocation they enter, has appropriated large sums of money for the conduct of special apprenticeship schools whose curricula and working problems have been written under the direction of competent building mechanics selected by the labor union organizations. In this Apprenticeship Commission work the whole effort has been to get the facts and then apply whatever remedy the facts demand.

Committees are at work to overcome as far as possible seasonal employment, to enforce the code of ethics adopted by the Congress, and to gather statistics regarding the functioning of the building industry at New York. This experiment, started at New York, is being tried also in Boston, Philadelphia, Seattle and in Portland, Oregon. From all places the reports are enthusiastic, though in some of them the movement is still in a very early stage.

Is there not in this movement food for thought for engineers? The efforts of the Congress certainly emphasize the mutual dependence of all branches of the industry upon each other, and bring home the responsibility of the industry to the public.

The Engineering Obligation

The engineer proudly claims to be a professional man. He looks first to the satisfactory performance of his work rather than to the dollars and cents return. He recognizes that his actions must square with a high ethical code, that he can do nothing for a client which will result in injustice to another. He can serve his client only when the client's purpose is honest and when others will not suffer from his client's action. He is looked upon for a certain degree of idealism. As a cultured man with a profound understanding of the operations of the laws of nature he is expected to look forward and to work not merely for the solution of the problems of the present day but to think as well of the future effect of what he designs and plans.

Such a position implies leadership in the community and an active acceptance of responsibility for aiding in the solution of such problems as I have put before you today. What new visions of usefulness to mankind are evoked by contemplation of the past results of research work! We shall lift further burdens from the backs of men. We shall turn into useful products materials that by present crude methods of recovery are useless. There shall be greater comfort, greater convenience, more leisure in the world because of that research for which we as engineers should be the leading protagonists.

But the mere supply of material comforts, of conveniences, will not alone bring satisfaction and happiness. Men work that they may live. But if their work is strife, if it is done with a feeling that others more powerful than they are circumventing them, they will put into the day's work only so much endeavor as is forced from them. The labor will become distasteful and their dissatisfaction will discolor their whole lives.

A Shifting of Interest

Unfortunately, through our minute division of labor we have shifted men's interest from their daily vocations to the pleasures which come after working hours. There was a day when the joy of craftsmanship led men to high endeavor. Would that we could restore it! Our engineering researches, however, seem to lead in the direction of greater specialization through the machine system than to general craftsmanship. But is there not hope of introducing a new satisfaction in work by getting all factors in the industrial structure to recognize their mutuality of interest, to drop strife in favor of co-operation, to shun ignorance and seek a true understanding of the industry's problems, so that each, contributing its experience, its aspirations and its visions, will work out toward a more harmonious industrial functioning.

Cannot we engineers be leaders in movements toward this better day? We have done our part well in reducing production costs and thus bringing the increased satisfaction which comes from higher standards of living. We must go further in this direction; our success in the past is an earnest of what we shall do in the future. But can we not think in a forward way, too, of the management relations in industry. True, there will never be perfect satisfaction in the world. Human nature is not so constituted. But we can, we must strive constantly for an improved order. It is an ideal worthy of all our striving to create better relations, greater satisfaction, greater happiness in our industrial structure.

Building Materials for Bermuda

In a report on the import requirements of the Bermudas, the Canadian Trade Commissioner, G. R. Stevens, makes some reference to the market for building materials in that country.

With regard to cement, the report states that it seems improbable that concrete will ever be used extensively for house construction in Bermuda while supplies of coral rock are so easily obtainable. This lime rock, however, is only suited for the construction of comparatively small buildings, and imports of cement will increase with the growth of the hotel and business community. At present Bermuda obtains cement both from the United Kingdom and from Canada. The contracts for construction are let in New York and London, and therefore orders for cement are generally placed in those centres. During the past years one or two large orders have been lost to Canadian and British firms on this account, owing to some defect in liaison between their home offices and the local agents. It is probable that contracts will continue to be let in New York, and the place to sell cement for Bermuda will therefore be in that city.

Distempers and Gypsum Paints

There is no fresh water in Bermuda; hillsides of an acre or more in extent are stripped of the coral rock and washed clean with a distemper in order to serve as "catches" for rain water. For these catches a lime wash which is burned and prepared locally is often used, but a considerable amount of gypsum and cold water paints are used on the smaller catches and particularly upon the roofs of houses, which are fluted and guttered to drain the rain water into tanks. In this latter connection "Alabastine" is much used, besides one or two similar preparations. For the walls of houses built of coral rock, a putty coat dressing is placed upon the rock, after which the wall is sealed with cement. For waterproofing purposes a British compound called "Pudlo" is mixed in the cement to prevent any possible porosity. Over this cement a gypsum wash is placed, and almost every house in Bermuda is remarkable for its meticulously cleanly appearance. The local authorities encourage and enforce this cleanliness, and on this account there is a considerable demand for gypsum paints, distempers, and cold water paints.

The Week's Developments in a Nutshell

E. J. Mehren, editor of the Engineering News-Record, in a fine address before the season's inaugural meeting of the Toronto Branch of the Engineering Institute of Canada made three important statements: (1) that further considerable stiffening in the price of steel products was inevitable on account of the shorter working day in steel plants; (2) that never in the history of the United States had the relationship between capital and labor been so strained as it is at the present moment, and (3) that the wages demanded by labor in the building and construction industry were more out of line than in any of the other industries.

One cannot evade the conviction that we in Canada are much better situated—in the matter of co-relationship at least. In spite of the fact that our neighbors to the south live under a democratic form of government it is doubtful if they realize, in anything like the same degree as Canada does, the real meaning of true democracy. We believe the co-operative spirit is growing in Canada, that capital and labor understand one another better and respect one another more than they did ten years ago.

The financial achievements of the past two weeks have shown what confidence Canadians have in themselves—in one another. Eighty per cent of our National Debt is now in the hands of Canadians themselves. It is always a matter of regret of course to have one's property mortgaged but its not so bad after all when the mortgage is in one's own vault.

Material prices hold firm. In one case only is any recession announced; this is a cut of approximately ten per cent in gravel.

How Should Small Houses be Planned?

Some Practical Points for the Builder—What Characterizes Good Architecture—The Factors to be Considered in the Determination of the Plan

By the National Lumber Manufacturers Association

Small houses often become old-fashioned long before they wear out—a result usually of poor, illogical design. Good planning and good designing survive changing customs, and from generation to generation produce the homes that never go out of style. There is no surer way to spread an appreciation of good planning and design than by practising it. Good planning is most essential in the small house because strict economy in plan and materials is necessary to bring the small house within the financial reach of the prospective owner.

It has come to be recognized that a community has a right to require that no building be erected that is unsafe or dangerous to health. But there is not the same concern that no building be erected that mars the surrounding landscape. In a very real sense every house is an integral part of community life even though the law is not invoked to compell all builders to follow sound architectural practices. Community spirit manifesting itself in the desire for home ownership has been more effective than any law could be in bringing about a demand for good architecture. We have come to know that the highest levels of our community life today are the sound guarantee against the erection of unsightly dwellings.

A Colonial frame house that has a genuine homey appeal and that combines compactness with dignity and comfort

Characteristic of Good Architecture

The characteristics of good architecture are simplicity, straightforwardness, and truth. Fashions and fads are avoided. Good architecture is pre-eminently practical and in small houses can be accomplished at low cost. The most humble dwelling may have all the elements that make a perfect architectural unit. Consideration must be given to a study of the most suitable style for the location considering the requirements of the family, the climatic conditions, the availability and suitability of building materials, the comparative costs in terms of service, and the limits of the purse. Unessentials and wasteful features wherever used produce complicated construction, inappropriate use of materials, and dollar waste. Good architecture for small houses is largely common sense so applied as to make the difference between a house, which is a mere shelter from the elements, and a home, which is beautiful, comfortable, and durable.

Many of the new houses shown in current architectural magazines are almost exact replicas of the buildings of two hundred years ago..

Surroundings

The natural conditions of the lot must be taken into consideration before determining the plan and style of the house. Grade, permanent trees, exposure to the sun and wind, street frontage, and the types of homes in the neighborhood are important factors. The house should be adapted to the size and shape of the lot. Broad lots should have a type of plan in which the end of the house faces the street. When shallow lots force the placing of the house near the street, the use of hedges, gateways, and enclosed porches will partially offset this disadvantage.

The Elevation

The elevation should be studied with the plan in order to produce a good design. For appearance, as well as for good drainage, the ground should slope away from a building in order that the building may not seem to be standing in a hollow.

Plan More Important Than Design

A good plan must grow from the foundation up. Each part of the structure must have its function, and each sub-division of the plan must be studied with respect to the other parts. While it is true that the architect or designer must give simultaneous consideration to plan and design, plan should govern the details of design.

A house is not a thing to be slapped together. It is something that demands careful consideration to effect a design and a plan that combines beauty, convenience and comfort

With the exception of the Colonial type, small houses usually assume an unsymmetrical form. The units of all forms are the square or the rectangular. Geometry plays an important part in the planning of small houses. The various geometrical units usually are arranged around a center line or axis or around a number of such lines or axis, and the dominant unit ordinarily is placed first. Other units are added to it in pleasing and interesting combination. The outstanding characteristic of the modern plan is compactness—elimination of useless rooms. Rooms are fewer in number than formerly and the rooms most frequently used are larger. The "back parlor" as well as the small den, the sewing room, and intricate hallways are not included in a well-planned small house

The same principle that applies to house planning in general, also applies to room planning The "axis rule" should govern in laying out openings in the wall and providing architectural furniture. Groups of windows, important doors, fireplaces, and other large or important features should likewise be placed on an axis. Each room or unit should have a distinct geometric plan of its own, even though a number of rooms open one upon another. One very good way to determine the shape of a room is to imagine the plan of the ceiling rather than the plan of the floor, for the ceiling plan is never continuous as is the floor plan. Correct planning requires first a study of room arrangements and their sizes; then stair and window locations, allowances for adequate wall space for usual furniture, and step and labor-saving devices,—in other words, a plan of the home from the "inside out."

The half-timbered house has had quite a vogue—and quite deservedly so, for the attractiveness of the home of that type is beyond question. The example shown here is not as extreme as some that have been designed but it is a most pleasing and graceful conception of the place of half timbering in house design.

Arrangement of Rooms

In the arrangement of rooms, space economy is essential. Means should be provided for getting easily from one part of the house to another. Generally speaking, all of the rooms on the first and second floors should be reached from the hall. Stairways almost invariably should lead direct from halls rather than from rooms. The living room should occupy the most desirable part of the house from the standpoint of exposure to the sun and view. A sun-room opening into the living room is a valuable addition which may be used twelve months in a year. Bedrooms, first of all, should be so placed as to be well ventilated. Whenever possible, there should be windows on two sides. The value of clothes closets depends as much on proper proportioning and arrangement of the doors as on size. A shallow closet or a very deep narrow one is of little use. For stairways a width of four feet is desirable. If the stairs must be narrow, wide landings should be provided to permit turning large pieces of furniture. Ceilings should not be too low, and tops of the windows should not be too far below the ceiling. The kitchen should be designed as a well-lighted, well-ventilated workshop and such economic considerations as the saving of steps, convenience of equipment, and the personal comfort of the occupant should receive attention. The kitchen is of such importance that it should receive the second choice of location in the house, the living room having the first.

Economy in Proper Sizes of Rooms

In considering economical sizes of rooms, attention is called to the fact that custom and habit have established practice so far as lengths of lumber are concerned. Too frequently unused lengths of joists, studs, flooring, and siding are strewn about houses nearing completion. Ultimately they are used for fuel.

In buildings, joists are placed sixteen inches on centres with an allowance of from three to four inches for lapping against studs. The most economical width, therefore, for a lumber-built house with one span of joists is six or eight inches less than an even width measuring from the inside of studs. If the building is over twenty feet in width, the joists will be in two lengths and a lap over the intermediate bearing partition must be included in figuring the amount of joist lumber required. This lap results in a six-inch loss of material. In planning floor layouts, it always should be remembered that short ends cut off of joists instead of being useless, will make excellent fire stops without additional expense.

Houses With the Hallmark of Quality

The "Red Seal" Signifies the Home that is Electrically Complete— If the Minimum Specifications Are Adhered to, the Builder Has a Big Selling Point

How can builders make their houses more saleable? That is a question that many builders have been trying to solve in recent months. With competition very keen in the house selling field, it has been found in many cases that those homes which have special refinements, which are just a little more complete or comfortable, or which have features that are somewhat above the average, are the ones that find buyers most readily. This point is emphasized in a circular recently sent out to builders by the Electric Service League, Toronto, who are inaugurating a campaign for better wired homes. Their letter reads: "The builders of Toronto have arrived at a period when selling houses is not easy. The housing shortage is a thing of the past. To sell a house now, at a profit, it must have special features to take the fancy of the buyer and please the women especially. Women now demand electric conveniences of all kinds and adequate wiring for these conveniences is a strong card for you as a seller. The red seal is an advertising method by which the electric home idea can be sold to home buyers. It gives you a big selling point —enables you to capitalize your wiring outlay—gives your house a distinguishing mark that attracts attention."

The Meaning of the Red Seal

This Red Seal—what is it? Some explanation of its meaning and purpose was given in our issue of October 3, page 950, but further details are given below:

It is a certificate, printed in seal form on weatherproof cardboard 20 inches square, for temporary display on the front of a house (if for sale) which is wired to a reasonable standard set by the League.

This seal is given free by the League to any builder or owner of a house for sale if, on inspection, by a League representative, it is found to conform to "Standard Electric Home" specifications set forth below. For permanent certification, a small transfer seal is placed on the service switch box.

These two seals on a house are an assurance to the public that that house is wired for a reasonably complete set of electric appliances and equipment.

Every house built should be wired during construction for complete electrical equipment. To wire it adequately during construction costs from 25 to 50 per cent less than a half-done job brought up to standard later.

Every house should have large enough feed wires (service) to provide for electric range, electric water-heater and electric grate. These are every-day essentials now.

Every house should have, in addition to standard lighting, at least one "convenience outlet" in every room. These outlets, often termed "plugs" are put in the baseboard or wall. They allow free use of all portable appliances, without unsightly cords hanging from overhead fixtures, and do away with awkward reaching to fixture sockets.

To qualify for a Red Seal, houses 6-rooms or smaller must have service wires (main feed) large enough to carry range and water-heater or grate, in addition to regular lighting and specified convenience outlets. Range wiring must be complete to point in kitchen. Houses 7-rooms and over must have service wiring for range, water-heater and grate, and be otherwise up to similar standard.

Cheap at Twice the Cost

The extra cost of putting in the heavier service and convenience outlets is a small item that has great value.

Wiring a house up to Red Seal Standard is an investment that adds many hundreds of dollars to the selling value, and permanently improves the marketability of a house.

The public wants well-wired homes, because electric appliances are indispensable in household work.

Many hundreds of dollars are spent on plumbing and heating. The electric service in a house is equally as important, yet it is a comparatively low-cost feature. Red Seal standard of wiring is the **cheapest big asset** you can put in a house for yourself or for sale.

The minimum specifications are as follows:

Minimum Specifications of Standard Electric Home

SERVICE

Houses 7 rooms and over—Standpipe and main switch capacity as required by Provincial Inspection Department, to provide for connected load of 180 amperes. Distribution box to have two extra 30 ampere 250 volt fuse blocks. Circuit panel to have provision for two spare circuits. Range wiring (three No. 6's) to be completed to point in kitchen.

Houses 6 rooms and under—Standpipe and main switch capacity as required by the Provincial Inspection Department, to provide for connected load of 140 amperes. Distribution box to have one extra 30 ampere 250 volt fuse block. Circuit panel to have provision for two space circuits. Range wiring (three No. 6's) to be completed to point in kitchen.

LIGHTING

Standard outlet in each room or main hall. Outlet on porch or main veranda, controlled from switch inside. Cellar stairway to have light, controlled from switch at top. Outlet in laundry over tubs. Outlet in front of furnace, unless otherwise lighted. Outlet over main stair turn, unless suitable illumination is provided by lower and upper hall lights.

Switches

All ceiling lights controlled from switches conveniently placed. Three-way switches on upstairs and downstairs hall lights.

CONVENIENCE OUTLETS

(Preferably Duplex or Twin Style)

2 in living room,
1 in dining room,
1 in kitchen,
1 in each bedroom,
2 in den or upstairs sitting room,
1 in sun room,
1 in laundry for washing machine, etc.
1 in sewing room, breakfast room, etc., (if any).

Photo by courtesy Imperial Oil Ltd.

Steel Makes the Good Highway Possible

The Part That Iron and Steel Play in Road Construction—Used for Machinery, Forms, Reinforcement, etc.—Old Rails Make Good Reinforcing Rods

When one comes to consider what highway construction involves and requires, one begins to realize to what extent the iron and steel industry contributes to the building of roads. In a very large number of ways, steel products enter into highway construction and any impetus in the building of roads affects the manufacturers of machinery, tools, forms, reinforcement, sign posts and a host of other items. The "Iron Trade Review" has been giving some consideration to this question and in an article by Frank G. Steinbach, makes some interesting comment with regard to the uses of steel in the highway field.

At the outset, the article states' it may be said that many new uses for iron and steel in roadbuilding have been discovered in the past few years. Briefly, products of the iron, steel and metal working industries are used for contractors' equipment; for culverts and other purposes in the preparation of the subsoil for a pavement; for steel reinforcement for retaining walls, abutments, the concrete pavement itself, curbs, expansion joints, etc.; and for highways signs, signposts, fences, guard rails, etc.

Road Building Equipment

Rapid strides are being made in the design and construction of road-building equipment. Not many years ago it was general practice in many parts of the country to construct roads by means of plow, scraper, dump-wagon and drag. Today a large highway job brings into use steam, gasoline or electric shovels, locomotive cranes, drag-line excavators, self-dumping motor trucks, tractors, steam engines and gasoline engines, air compressors, concrete mixers with distributing equipment, grading machines, steam rollers, and standard steel concrete forms. On exceptionally large contracts, narrow-gage portable track, industrial locomotives and dump cars are employed.

Steam shovels recently have assumed a place of first importance in the road-building industry. The manufacturers of these purchase motors, electrical control apparatus, gasoline motors, motor accessories, tank and boiler steel, fabricated boilers, steam gages and boiler fittings, crankshafts, connecting rods, drop forgings, all kinds of castings, shafting, steel cable, pipe and pipe fittings, structural steel, manganese steel dipper points, brass and bronze bushings, corrugated sheet roofing, sheave wheels, ball bearings, bolts, nuts, rivets, etc.

As in the case of steam shovels, locomotive cranes have been adapted to the requirements of road building. Mounted on broad-wheeled trailers or caterpillar trucks and equipped with self-closing excavating buckets or drag-line buckets, these cranes find extensive use in cutting and back-filling on rough terrain. The crane builders are consumers of practically the same materials as are used in the construction of steam shovels. Chain, plates, sheets, rivets, and manganese steel castings are the principal materials employed in fabricating buckets.

It is impossible to estimate the extent to which motor trucks and gasoline tractors are used in the construction of roads. However, it is safe to say that these vehicles have practically replaced horse-drawn wagons and scrapers on large jobs.

Steam and gasoline engines play important parts in modern highway construction. Seldom used independently, they usually are built into the machines for which they furnish power. Their principal applications are in connection with air compressors, concrete mixers and water pumps.

Compressed Air Now Used

Compressed air is a comparatively recent entry in the field of road work. Thus far its use has been confined principally to the operation of pavement chippers, which are used for breaking up the top layer of road preparatory to resurfacing. In blasting through rock to make way for a new road, of course, compressed air fulfills its well known mission in the operation of rock drills.

Pumps often are required to assist in draining low land, to bring water to boilers from distant sources of supply, or to flood subsoil before the first layer of concrete is put down. In many of the smaller contracts, however, hand pumps and water carts serve these purposes.

Steam rollers, once considered as equipment employed only on city streets, now are frequently used in the general field of highway construction. They provide the only effective means of pounding down earth in fills and smoothing the subsoil prior to the placing of concrete. In surfacing asphalt, they are practically indispensable when large areas are involved. Boiler plate, rivets, forgings, machine bolts, shaftings, castings, bushings, valves, pipe fittings, steam packing, grates, sheets, and small shapes are the principal products entering into the construction of rollers.

Although the great improvement in the design of concrete mixers has been brought about largely through the spectacular expansion in the use of concrete for buildings, piers, bridges and foundations, the requirements of road-building have been considered of sufficient importance by builders of mixers to prompt them to develop special equipment for that purpose. As a result, the modern apparatus for preparing concrete for highway construction is literally a paving machine rather than a mere mixer.

Its chief elements are a boiler and engine or gasoline motor, a mixing drum with power-driven charger and pouring device, and a monorail distributing arm and carrier for conveying the mixed concrete to the pavement. Many of these machines are self-propelled.

Steel Supplants Wood for Forms

Perhaps the most recent application of steel to road contractor's equipment is found in the development of steel road forms. The forms usually are of 3/16-inch material, cut in suitable lengths of 12 feet or less and provided with joints, stakes, etc. No less than five companies are known to be engaged in the fabrication of steel road forms, while about a dozen make steel forms for concrete culverts.

Although the principal items of contractors' equipment have been mentioned in the foregoing paragraphs, manufacturers interested in the purchasing power of the roadbuilding industry should not overlook the large quantities of relatively small articles that are consumed. The list includes steel picks, shovels, hoes, crowbars, axes, sledges, hammers, trowels scythes, brush hooks, hatchets, saws, wrenches, wheelbarrows, galvanized steel pails, lanterns, pipe, gasoline and water tanks, steel tape and levels.

It is obvious from the foregoing that builders of contractors' equipment draw largely upon the foundries, forge shops, steel fabricating establishments, machine shops and machinery supply houses for their needs.

Iron and steel sheets for corrugated culverts and steel reinforcing bars for retaining walls and the pavement proper constitute practically all of the steel now employed in road building.

Various types of steel fabric and bars have been used in the past as a means of supplying the needed tensile strength. The amount of steel used, in most cases, has not been based on calculated stresses, but has been determined by results gained under service. Steel has not been used in sufficient quantities to prevent cracking altogether, but has served in a way to minimize the breaking up of the slab. Many types of reinforcing materials have been used by highway engineers, many basing selection on results obtained in severe service. Smooth or deformed bars, expanded metal, welded or woven mesh fabrics and structural shapes are some of the combinations that have been used. The weight of material used varies all the way from 20 to 150 pounds per 100 square feet. Recently, however, the amount of reinforcing has been increased.

Use of Wire Mesh

According to reports on concrete roads, reinforcing composed of wire wesh or expanded metal and deformed bars should be placed in both crosswise and longitudinal directions, and should be placed not less than 2 inches from the finished surface of the pavement. The reinforcing should extend to within 2 inches of all joints, but must not cross any joint. The reinforcement should preferably be placed at both the top and bottom of the pavement. Wire fabric can be shipped in either rolls or sheets, depending on the handling methods to be used on the job.

Data taken on roads constructed in 1921 shows that the use of this type of reinforcing will add from 30 to 60 cents per square yard to the cost of the pavement. The additional cost is no doubt responsible for the fact that concrete pavements generally have not been reinforced in the past.

Another form of reinforcing consists of ¾-inch bars placed halfway between the top and bottom of the pavement, approximately 6 inches from the edges and completely around the slab. Reinforcement of this type gives added strength to the edges where the cracks usually begin, and on a soft subgrade serves to hold the pavement together should cracking occur. Another form of reinforcement consists of two corrugated bars fabricated into a unit by means of chairs spaced approximately at 3-foot intervals along the bars. The chairs are made of No. 16 gage band steel, and formed to meet requirements of standard designs 6, 7 and 8-inch road slabs. This material is manufactured in units to meet the required specifications and these units are assembled by means of an assembling frame or template with the top and bottom longitudinal bars fastened to the frame by means of spring wire clips or other fastening devices. The mat produced by this method of assembly is rigid enough that it may be carried from the place of assembly to the position in the road without disturbing the relative position of the bars.

Old Rails for New Roads

The increasing use of concrete bars for roads brings out a significant example of conservation. The weight and dimensions of steel rails has increased so rapidly that great tonnages of rails put down a comparatively few years ago are too light for present day rolling stock. These rails either are relaid on infrequently used sidings or sold for scrap. A few years ago, a method was developed by which these rails are slit longitudinally into three parts—head, web and base. Thus by this process of reclamation, an appreciable proportion of the cast-off steel of the railroads finds its way back to the service of transportation in the form of reinforcement for roads.

In a number of localities, the use of rail steel bars has been prevented by a clause in the specifications stating that the bars shall be "rolled from new billets." Manufacturers of rail steel have given wide publicity to the physical properties of their product with the result that in a number of instances highway commissions have opened their specifications to rail bars. The educational campaign that is spreading information regarding steel is being conducted by the Rail Steel Products Association comprising nearly a score of manufacturers, seven of which specialize in reinforcing bars. The members of the association produce about 1,000,000 tons of rail steel annually.

While the largest tonnages of steel are used for the purposes of reinforcing concrete slabs, steel finds other uses in road building. In an endeavor to control the longitudinal cracks which might develop in concrete roads, several state highway commissions are embodying in their standard designs a sheet metal expansion joint at the center of the road. This joint is continuous throughout the length of the road, and in most cases extending through the entire thickness of the slab. While constructing the block of concrete a temporary joint cap is placed on the top of the metal sheet. After the concrete has set the cap is removed and the space filled with asphalt.

Steel bars are also used to protect concrete curbs against abrasion and shocks and at the same time to serve as a reinforcement and a means of preventing cracks. The anchorage of the bar has a series of large holes, the steel extending into the slag a good distance. The open spaces in the anchorage allow the concrete to flow around it and prevent the separation of the concrete at the corners. The rigidity of these bars makes them easy to install.

Motorists Believe in Signs

Still another phase of modern road building affecting the metal working industries is the increasing use of the metal highway signs. Not many years ago, before the automobile came into general use, it was not unusual to find important crossroads without signs for the guidance of the public. With the coming of the automobile and with the growing practice of drivers to seek out new roads, it has been almost necessary to plainly label each road intersection. In recent years, in the attempt of various state highways commissions and automobile clubs to standardize these road signs, the old type of wooden signs has given way to neatly stamped metal signs. In many cases standard warning signs such as are used to warn motorists of the presence of railroad crossings, steep hills, sharp curves, etc., are stamped in large presses and enameled with standard colors.

Mechanical Equipment Cuts Cost of Handling Coal

Belt Conveyor Piled Coal at a Cost of 15 Cents Per Ton as Against 40 Cents by Hand—How Coal can be Profitably Piled

By RUSSELL B. WILLIAMS
Link-Belt Co., Chicago

The storage of coal with the average industrial user is largely a matter of facilities. And because of this there are, here and there, factories that find it impossible to store coal. We are prone to look at "big" examples in everything, however, forgetting the smaller and more ordinary things. Perhaps because of this habit, those who are in a position to store coal hesitate doing so because of the erroneous belief that large investments and complex systems must be made. Hence it is that instances of the more modest means are here given to show their practicability and prove the economy almost every executive can effect for his company through their introduction.

The Bristol Patent Leather Company of Bristol, Pennsylvania, uses about 4,500 tons of run-of-mine bituminous coal a year, and has plenty of ground space on which it can be spread out. They keep several hundred tons on hand.

During the war they found that it was costing about 35 cents a ton to unload, pile and reclaim this coal. This they felt to be a cost entirely out of proportion to its value and began an investigation of a system of coal storage that would handle their volume of coal more economically.

In the discussion of ways and means of storing and reclaiming the coal, the Link-Belt Company (Philadephia office) prepared the practical plan which included a standard portable belt conveyor for unloading and storing the coal in the space available. This plan was adopted and a 31-foot machine was installed and put into operation. This conveyor, at an angle of 30 degrees will pile 13′ 6″ high, but as is shown in the drawing, the conveyor is lowered so that it piles but to a height of eight feet. This prevents burying the wheels. The machine was made to pivot, which enabled it to serve an arc about 36′ long, with a minimum handling of the machine. Thus an 8′ pile

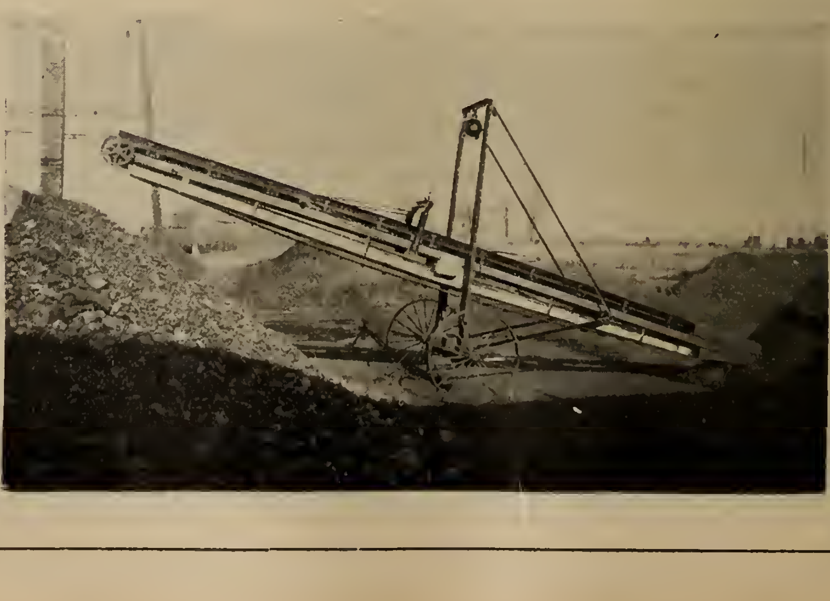


Fig. 1—31′ Link-Belt portable belt conveyor used by Bristol Patent Leather Company for handling bituminous coal from cars to storage pile.

36′ long gives a storage of about 70 tons. The drawing shows how the portable belt conveyor backs away from the pile as the coal is stored out.

$1100 Saving on 4500 Tons

In actual operation this plan and equipment worked out somewhat as follows:

Fixed charges per year:		
Depreciation at 20% (conservative)	$208.20	
Interest, figured on an average investment of $521 at 6% ..	31.26	
Upkeep per year	50.00	
Electric current	25.00	
		$314.46
Labor charges when handling coal by portable belt conveyor, based on 4,500 tons (assume 90 cars) 10 hours per car at 40c per hour	360.00	
		$360.00

Total cost of handling coal—$674.46
—or about 15c the ton.

Compared with these figures, the cost of handling by hand, using 40c per ton for 4,500 tons, we have a total of $1800.00, which equals a saving of something over $1100.00 in favor of the conveyor.

Another very simple and inexpensive way to handle stored coal is that of employing the power hoe or drag scraper. Figure 3 shows a typical installation of the power hoe. The coal is received in railroad cars, dumped into a portable belt conveyor which discharges it to the initial pile alongside of the railroad track. The hoe is moved to and fro by a steel cable, the ends of which are fastened to driving drums in the operator's house, which is so arranged to give a clear view of the storage pile. The cable passes around sheaves so located as to serve the storage yard. Thus the hoe or drag takes the coal away from the initial pile, placing it on that portion of the storage pile which can more easily bear additional tonnage. The empty hoe rides on top of the coal until it returns to the initial pile and the cycle of operation is repeated.

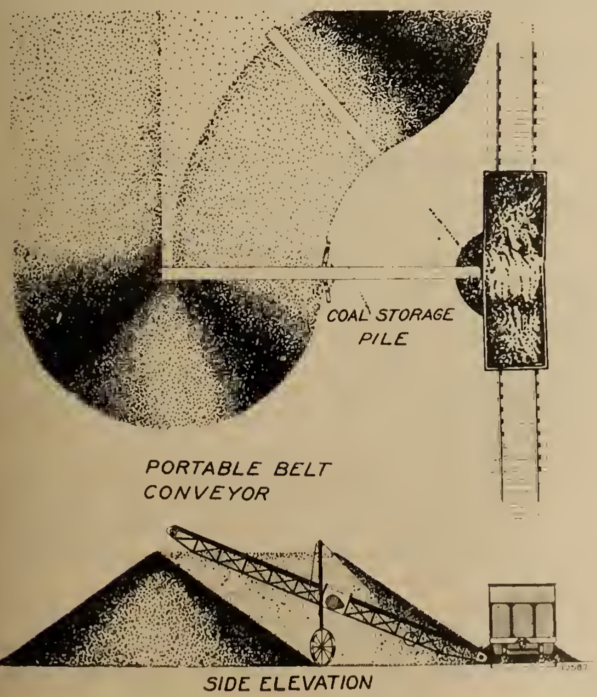


Fig. 2—Showing method of handling coal from cars to storage pile

When reclaiming from storage, the hoe's attachment to the cable is reversed, thus moving the coal in the opposite direction.

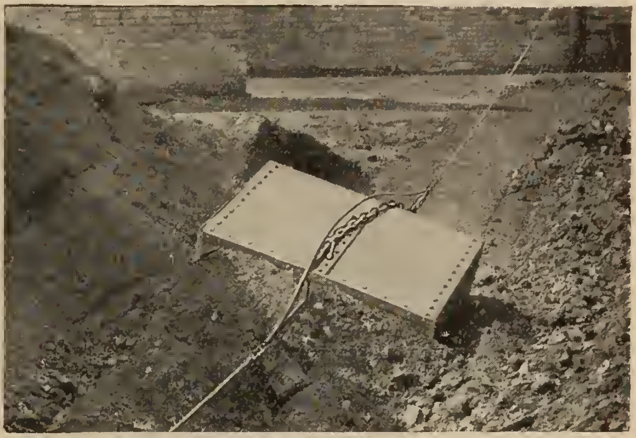


Fig. 3—Power hoe reclaiming coal from storage

Edmonton School Tenders

The following tenders were received in connection with the building of Riverdale School at Edmonton, Alta.

General Contract

T. Ingram, Edmonton (accepted) ..	$55,899
Carter-Halls-Aldinger Co.	59,500
H. G. MacDonald & Co.	57,433
Pheasey & Batson	57,974
Poole Construction Co., Ltd.	58,312
Thomas Jamieson & MacKenzie	61,485
L. F. Toby	58,153

Plumbing, Heating and Ventilating

C. R. Frost, Edmonton (accepted) ..	$17,966
H. Kelly & Co.	17,345
Lockerbie & Hole	18,520
Standard Plumbing & Heating Co. ...	18,976
Templeman Bros.	19,976

Tenders for Selkirk Hospital

The following tenders were recently received in connection with the completion of power house for the hospital for Mental Diseases, Selkirk, Man.

J. McDiarmid Co., Ltd., Winnipeg, Man. (accepted)	$37,835.00
H. Sigurdson	38,156.00
Claydon Co., Ltd.	39,497.00
Sutherland Construction Co., Ltd.	41,400.00
Wallace & Aikins, Ltd.	41,874.00
John Gunn & Sons, Ltd.	43,000.00
Fraser & McDonald	44,209.00
Carter Halls Aldinger Co., Ltd.	44,487.00
Hazelton & Walin, Ltd.	46,014.00
Macaw & McDonald	48,184.47

Water Supply Affected by Powder Works

The Superior Board of Health of the Province of Quebec reports one water supply affected by acid wastes from a powder works. The remedy consisted in neutralizing the acidity prior to the discharge of the wastes.

Effect of Industrial Wastes on Water Supplies

With the rapid growth of industries the injurious effects of industrial wastes on water supplies and water purification processes are becoming more and more important. Serious trouble from this source has already been experienced in numerous places, according to a report of an A.W.W.A. committee.

Certain wastes, alone or in combination, may have beneficial effects on the water supply by disinfecting action or clarification, states this report, but most industrial wastes are detrimental to water supplies. The injury depends upon the character and relative quantities of the substances discharged, with effects which may be classified as follows:

1. Suspended or colloidal mineral matters which increase turbidity and add to the difficulty and expense of coagulation or of filtration, as, for example, coal and ore washing wastes.
2. Dissolved mineral matter impairing the quality of the water and increasing the difficulty and expense of water purification, as, for example, acid mine drainage and salt water from oil wells.
3. Vegetable and animal organic matters in solution or in suspension, which increase the color, turbidity, suspended matter and bacterial content, thereby increasing the difficulty and expense of water purification, as, for example, beet sugar refinery wastes and tannery wastes.
4. Taste and odor producing substances, either organic or mineral in nature, as, for example, phenols in the wastes from gas and coke manufacturing, and sulphite liquors from paper pulp mills.
5. Substances, either organic or mineral, tending to stimulate growths of organisms and thereby increase the difficulty and expense of treatment, as, for example, organic sulphur compounds in wool scouring wastes, and mineralized nitrogen from oxidation of organic wastes of various kinds.
6. Harmful bacteria, as, for example, the anthrax bacilli in tannery wastes.
7. Poisons, as, for example, cyanide from the cyanide process of gold extraction.

Solution for Problems Due to Industrial Wastes

There are three general methods of attacking problems of water supply resulting from the discharge of industrial wastes.

1. Treatment of the polluted water.
2. Treatment of industrial wastes prior to discharge.
3. Elimination of industrial wastes from the source of water supply.

There are some kinds of industrial waste which may be handled by water purification plants without serious overload or impairment of the quality of purified water. In other cases, the pollution may be of such nature and of such amount as to necessitate special treatment at the water purification plant with closer supervision and increased operating cost. There are some wastes, however, which are of such obnoxious character that ordinary purification plants are not able to handle them successfully. Feasibility of recovery of valuable by-products from industrial wastes must not be overlooked.

Preventive measures are needed to control the discharge of industrial wastes into existing or potential sources of water supply. Due regard must be had for established industries and arbitrary and unreasonable measures should not be used against them. The problem must be considered from the broad viewpoint of public welfare.

Short Course in Highway Engineering

The University of Michigan once more plans to conduct graduate short period courses in highway engineering during the winter months. The schedule of instruction is as follows:

December 3 to 14, 1923: Highway engineering financing, management and organization—Professor Swinton. American and English highway transport methods—Professor Blanchard.

December 17 to 29, 1923: Highway transport economics and surveys—Professors Blanchard and Swinton. Gravel and broken stone roads, dust prevention and bituminous surfaces.—Professors Blanchard and Swinton.

December 31, 1923, to January 11, 1924: Brick, cement-concrete, stone block and wood block pavements.—Professor Bateman. Interrelationship of highway, railway and waterway transport.—Professors Riggs and Worley.

January 14 to 25, 1924: Bituminous macadam, bituminous concrete and sheet-asphalt pavements.—Professor Blanchard. Highway transport costs and record systems.—Professor Swinton.

January 28 to February 8, 1924: Highway laboratory research.—Professor Bateman. Highway structures.—Professors Gram and Cissel. Mechanism operation and maintenance of motor trucks, tractors and trailers.—Professor Lay.

February 11 to 14, 1924: Tenth annual Michigan conference on highway engineering.

February 18 to 29, 1924: Highway specifications, contracts and jurisprudence.—Professor Riggs. Highway transport management.—Professor Swinton.

March 3 to 14, 1924: Highway engineering theory and design.—Professor Swinton. Grading machinery and operations, drainage systems, and earth and sand-clay roads.—Professor Bateman. Highway transport legislation and traffic regulations.—Professor Blanchard.

Full information may be obtained from Prof. A. H. Blanchard, University of Michigan, Ann Arbor, Mich.

Enquiries From Foreign Markets

The following trade enquiries may be of interest to Canadian manufacturers of the materials or devices referred to. Further information will be supplied by the editor by quoting the number indicated:

2545. Bridges for Light Railways.—Standard designs and c.i.f. Sourbaya quotations would interest engineering house for bridges, 20 metres, 40 metres in 2 parts, and 60 metres in 2 parts, of lightest possible construction as no wing pressures. German competition to be met.

2569. Asbestos.—Japanese commission house in Kobe desires to receive samples and prices of Canadian asbestos fibre of various grades. This firm have never had any experience in selling asbestos before, but state that they have clients interested.

2570. Crude Asbestos.—A Sourabaya house, with buying office in Holland, would be glad of prices c.i.f. Sourabaya from time to time and full particulars.

What One Contracting Organization Does

To Keep Down Construction Costs

How Needless Expense in Tracing Shipments is Eliminated—Where Responsibility Lies for Prompt Delivery

By DWIGHT P. ROBINSON & CO.
Engineers and Contractors, Montreal and New York

The importance of keeping construction costs down to bed-rock is obvious, and the method of handling shipments is an important factor of these costs. Every dollar paid for express where freight might serve, or for tracing and expediting, is a tax that adds to the cost of a job. The client not only has to pay this extra cost, but has to pay fixed charges for interest, insurance and depreciation on this extra cost as long as the structure stands. It is therefore important that the need for express shipments, tracing and expediting, and personal car tracing be eliminated wherever possible. On a rush job, where the next-to-impossible in fast work is expected, such expenses may be warranted, and in that case the effective use of these methods is part of the service expected. However, even in this sort of job undue use of man tracers must be continually guarded against.

Recently a case came to attention which the cost of expediting and tracing a small motor was equal to the cost of the motor—a 100% tax for tracing. In several other cases on a rush job the cost of riding freight cars through to the job has added 10 to 25% to the cost of the material. These cases were justified in the eyes of the client and it is our business to see that they occur only when they are justifiable.

Eliminating the Expense of Tracing

We have within our control many points which require intelligence, painstaking care and unremitting vigilance on the part of many different individuals in all departments that carry the responsibility for getting material to carry jobs at the right time. The "ounce of prevention" that costs only a small fraction of the "pound of cure" can be applied to express charges, tracing and expediting. Elimination of needless expense of this character involves precautions that may be summarized as follows:

1. At the beginning of a job a time study is made and progress charts are laid out showing all of the principal items entering into the work, due consideration being given to conditions in the market.

2. Drafting room schedules of plans are made from the progress chart as a base, and definite knowledge is secured to fix dates for the issue of drawings that leave a reasonable margin of time for normal purchasing procedure—avoiding, when possible, the need for paying a premium for abnormal performance on the part of producers of the materials purchased.

3. Purchasing is done with strict regard for the same factors, and the engineers and construction men in charge of a job stndy the plans in conjunction with the progress chart to prevent the oversight of some minor material item that may later check field progress.

4. A "promising" salesman is always a menace, and it is, therefore, necessary in some cases to go back of his delivery promises and secure confirmation from his factory or by personal investigation by one of our men to make sure that the performance will be as good as the salesman's promise. It costs less to spend a little for insurance at this point than it does to worry through an ill advised contract with a slippery vendor.

5. The client's knowledge of the vendors in his locality is the first and most important index to local conditions, and the fullest use of his facilities is a primary essential for that co-operation which tends to keep costs at a minimum. Using all available data, consideration should be given to the location of the vendor's shipping point with reference to the destination. Sometimes the local vendor has a natural advantage that should be given weight when considering a lower price from a more distinct shipper. As a job gathers age the field office learns much concerning local sources of material supply. This knowledge is always available for the asking and is sometimes forwarded to headquarters without request and should influence the placing of orders. Sometimes the local vendor is the one to avoid and a factory a thousand miles away is a safer selection.

6. Field offices are instructed not to assume that the head office is either infallible or omniscient. The superintendent of construction and some of his men are continually making critical studies of material needs and passing their knowledge along to those who are responsible for purchasing and following up deliveries.

7. Two men—the supervising engineer and the superintendent of construction—carry the primary responsibility for any failures to provide material which may delay the job, disarrange normal field procedure, necessitate expediting, man tracers, express charges, demurrage and rehandling after delivery, but as their time is limited to twenty-four hours a day each, there are many others in the organization who contribute to the defence against such failures as occasionally creep into the best regulated jobs.

We have a highly developed system for handling every move from the inception of drawings to the completion of the assembly of the thousands of components entering into our most complex construction operations, but that system is as good and no better than the quality of brains that operate each and every part of it.

A normally large job requires not merely a matter of a dozen or so contracts and orders for the major items such as structural steel, cement concrete aggregate, brick, sash, marble, turbines, boilers, condensers, and switchboards; there are from three thousand to eight thousand separate orders and contracts on such a job and of these there are from five hundred to one thousand, each of which carries the possibility of delay or extra expense for tracing or express, unless everyone who has a part in handling some phase of each order does his part up to 100% efficiency.

How Should Concrete Floors be Built?

Proper Construction Must be Used if Floors are to Wear Well and Give Good Service—A. C. I. Specifications are Recognized as Standard

(Continued from last issue)

VI. Two-Course Plain Concrete Floors

A. CONCRETE BASE

Proportions

48. The concrete shall be mixed in the proportions by volume of one (1) sack of portland cement, two and one-half (2½) cu. ft. of fine aggregate and five (5) cu. ft. of coarse aggregate.

Consistency

49. The materials shall be mixed wet enough to produce a concrete of a consistency that will flush readily under slight tamping, but which can be handled without causing a separation of the coarse aggregate from the mortar.

Placing

50. After mixing, the concrete shall be handled rapidly and the successive batches deposited in a continuous operation completing individual sections of the required depth and width. Under no circumstances shall concrete that has partly hardened be used. The forms shall be filled and the concrete struck off and tamped to a surface the thickness of the wearing course below the established elevation of the floor. The method of placing the various sections shall be such as to produce a straight, clean-cut joint between them so as to make each section an independent unit. If dirt, sand or dust collects on the base it shall be removed before the wearing course is applied. Workmen shall not be permitted to walk on the freshly laid concrete. Any concrete in excess of that needed to complete a section at the stopping of work shall not be used. In no case shall concrete be deposited upon a frozen subgrade or subbase.

Reinforcements

51. Slabs having an area of more than one hundred (100) sq. ft. shall be reinforced with wire fabric, or with plain or deformed bars. The reinforcement shall have a weight of not less than twenty-eight (28) lb. per one hundred (100) sq. ft. The reinforcement shall be placed upon and slightly pressed in the concrete base immediately after the base is placed. It shall not cross joints and shall be lapped sufficiently to develop the full strength of the metal.

As stated above plain floor slabs of the usual thickness and mixtures, should not have dimensions greater than 10 feet between joints in order to insure against cracking caused by the tensile stresses developed by contraction. When it is necessary to place slabs with dimensions greater than 10 feet, reinforcement should be provided to resist these tensile stresses. It is apparent that if the reinforcement is allowed to extend through an expansion joint, the purpose of the joint would be defeated, because the metal would prevent any movement at the joint. If reinforcement is not lapped sufficiently at its edges or joints such joints would be planes of weakness and would allow cracks to form there.

B. WEARING COURSE

Proportions for Mixture No. 1

52. The wearing course shall be mixed in the proportions of one (1) sack of portland cement, two (2) cu. ft. of fine aggregate. The minimum thickness shall be three-quarters (¾) inch.

Proportions for Mixture No. 2

53. The wearing course shall be mixed in the proportions of one (1) sack of portland cement and one (1) cu. ft. of fine aggregate and one (1) cu. ft. of No. 1 aggregate for wearing course. The minimum thickness shall be three-quarters (¾) inch.

Consistency

54. The mortar shall be of the driest consistency possible to work with a sawing motion of the strikeboard.

Placing

55. The wearing course shall be placed immediately after mixing. It shall be deposited on the fresh concrete of the base before the latter has appreciably hardened, and brought to the established grade with a strikeboard. In no case shall more than forty-five (45) minutes elapse between the time the concrete for the base is mixed and the wearing course is placed.

Finishing

56. After the wearing course has been brought to the established grade by means of a strikeboard, it shall be worked with a wood float in a manner which will thoroughly compact it and provide a surface free from depressions or irregularities of any kind. When required, the surface shall be steel-troweled, but excessive working shall be avoided. A mixture of dry cement, sand and number one aggregate may be applied to the fresh concrete of the base for a wearing course, but in no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface of the wearing course to absorb moisture or to hasten the hardening. Special methods conflicting with these specifications may be used.

Coloring

57. If artificial coloring is used, it must be incorporated with the entire wearing course, and shall be mixed dry with the cement and aggregate until the mixture is of a uniform color. In no case shall the amount of coloring exceed five (5) per cent of the weight of the cement.

Many attractive surfaces can be obtained in concrete floors by using colored aggregates or mineral coloring materials with either grey or white portland cement. An infinite variety of patterns can be set into the wearing course by using two or more different mortar mixtures. The Terrazzo or Venetian finish is often used in lobbies, corridors and show rooms. Marble or other small chips are added to the mixture for the wearing course and after it is laid additional chips are strewn upon the surface and rolled in. After the surface has hardened somewhat, it is ground down, thus obtaining a hard, smooth, polished surface consisting mainly of chips, very little of the cement mortar being visible.

A concrete floor can be prepared for dancing by waxing in a manner similar to that used for a wooden floor, or by several applications of liquid soap well rubbed into the floor, or by a special process that drives liquid wax into the concrete. Concrete floors can be protected from the action of acid solutions by several different treatments, the choice depending on local conditions.

VII. One-Course Floors

Proportions

58. The concrete shall be mixed in the proportions of one (1) sack of portland cement to not more than two (2) cu. ft. of fine aggregate and not more than three (3) cu. ft. of coarse aggregate, and in no case shall the volume of the fine aggregate be less than one-half (½) the volume of the coarse aggregate.

A cubic yard of concrete in place shall contain not less than six and eight-tenths (6.8) cu. ft. of cement.

Consistency

59. The materials shall be mixed with sufficient water to produce a concrete which will hold its shape when struck off with a strikeboard. The consistency shall not be such as to cause a separation of mortar from the course aggregate in handling.

Placing

60. After mixing, the concrete shall be handled rapidly and the successive batches deposited in a continuous operation completing individual sections to the required depth and width. Under no circumstances shall concrete that has partly hardened be used. The forms shall be filled and the concrete brought to the established grade with a strikeboard. The method of placing the various sections shall be such as to produce a straight, clean-cut joint between them so as to make each section an independent unit. Any concrete in excess of that needed to complete a section at the stopping of work shall not be used.

Reinforcement

61. Slabs having an area of more than one hundred (100) sq. ft., or having any dimensions greater than ten (10) ft., shall be reinforced with wire fabric or with plain or deformed bars. The reinforcement shall have a weight of not less than twenty-eight (28) lb. per one hundred (100) sq. ft. The reinforcement shall be placed upon and slightly pressed into the concrete base immediately after the base is placed. It shall not cross joints and shall be lapped sufficiently to develop the full strength of the metal.

Finishing

62. After the concrete has been brought to the established grade by means of a strikeboard, and has hardened somewhat, but is still workable, it shall be floated with a wood float in a manner which will thoroughly compact it and provide an even surface. When required, the surface shall be steel troweled, but excessive working shall be avoided. Unless protected by metal, the surface edges of all slabs shall be rounded one-half (½) inch.

Although usually a one-course floor cannot be given quite as smooth a surface as a two-course floor or any of the special finishes or treatments, yet where such finishes are not desired, it is considered the better type of floor, because of being a monolithic slab, it is stronger structurally, and it can be laid more easily and quickly. In order to obtain a reasonably smooth surface a somewhat richer mixture should be used and more care should be taken with the finishing. If these precautions are observed a satisfactory and durable surface will be secured.

Sidewalk Contracts in Scarboro

The contracts for the sidewalks in the Danforth Avenue area and Birch Cliff Heights area, Scarboro Township, Ont., were awarded to E. J. Elliott, 279 Main St., Toronto, and the contracts for sidewalks in the Kingston Road area, to Mr. W. B. Hughes, 83 Victoria Park Ave., Toronto. The prices for the Danforth and Birch Cliff contracts were: walk 19½ cts.; excavation, 65 cts.; fill, 80 cts.; and for the Kingston Road contract: walk, 17 cts.; excavation, 70 cts., and fill $1.25. The other bidders were the Grant Contracting Co., 47 Wellington St. E., Toronto; J. E. Coughey, Wallaceburg, Ont., and A. C. Johnson, 17 Fairmont Crescent, Toronto.

The Measurement of Large Volumes of Water

By D. BROWNLIE, London, England

The tendency everywhere in engineering today is to adopt more and more the principles of exact measurement, even to the very largest volumes of gases and liquids, so as to do away with the old rule-of-thumb principles.

One example of this tendency as applied to gases is the recent suggestion to "box" in large boiler plants and measure all the air passing in for combustion, just as the fuel and water are measured. In somewhat the same way huge volumes of gas, such as from blast furnaces and coke ovens, will soon be controlled and recorded regularly.

As regards very large volumes of water, the science of measurement is already well advanced, as indicated by Mr. E. Bruce Ball's paper, "The Storage and Handling of Water," read at the Institution of Mechanical Engineers. A section of the paper was devoted to the measurement of bulk water supplies, and, as Mr. Ball explained, when the water has an open surface and sufficient fall, the principle of the "V," of "Weir" notch is generally adopted, the water being allowed to flow through a series of notches of known dimensions.

A "V" notch recorded is, of course, essentially an instrument for measuring continuously the height of the water flowing through the notch, and by means of suitable mechanism recording this direct in terms of gallons of water.

One modern instrument for very large supplies of water includes both a device for giving a continuous record in the form of a curve by means of a pen and chart driven by clockwork, and an integrating mechanism to add up the figures.

When the water is flowing in very large pipes, as for example, in water power work, either the "venturi" or the "Pitot" tube principle is adopted, the latest development of the "Pitot"tube in this connection being the recording pitometer.

In this latter instrument the flow of the water is measured by means of a composite rod, introduced into the pipe through a 1 in. stop cock, containing the usual "Pitot" tube, one small tube bent facing the flow of the water and the other the reverse way. The recording device is essentially a very delicate and sensitive differential pressure recorder, graduated directly in gallons of water on the usual principle.

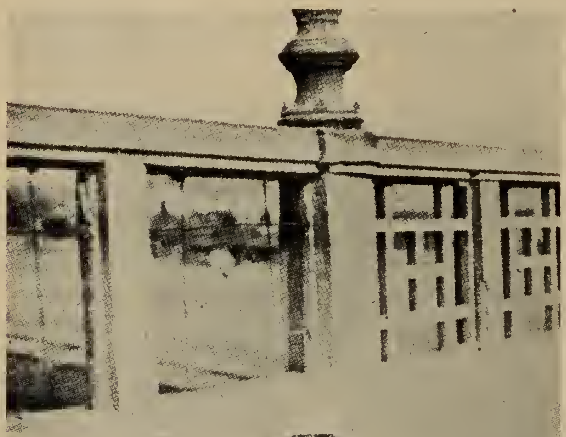
When the "venturi" tube principle is adopted the form generally used is a simple hollow disc of less diameter than the pipe. Since the same volume of water is always flowing in the pipe at any one portion the velocity through the disc is greater since the same bulk of water has to pass through less space. Consequently a small pipe at the disc has a slightly greater pressure than one in the ordinary flow, and in the same way as in the "Pitot" tube, this small difference of pressure is a measure of the amount of water flowing.

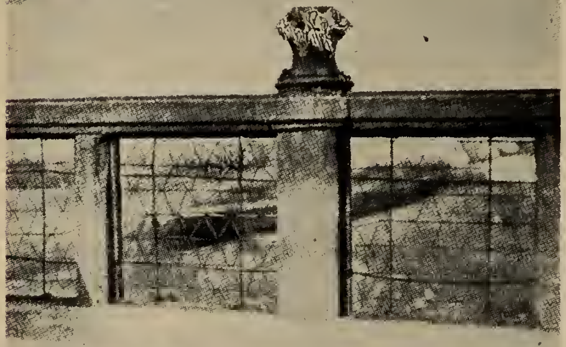
Hints for the Contractor

Viaduct Repaired with Gunite

Flue gases from passing locomotives caused the Kellogg street viaduct in Wichita, Kansas, to deteriorate in such a manner as to necessitate a complete overhauling at an expense of approximately $45,000. The viaduct, 2,000 ft. long, which carries the business traffic of the city over the railway yards, has been in use for the past seven years.

It is the opinion of the city engineer that the concrete surfacing was not heavy enough over the reinforcing steel to withstand the fuel gases and that the sulphur fumes from coal smoke united with the moisture on the concrete and formed sulphurous acid and then sulphuric acid. The action of the acids caused the concrete to crack and expose the steel reinforcement of the structure. In seven years time the surface concrete was cracked in innumerable places and the structure was undoubtedly being weakened.





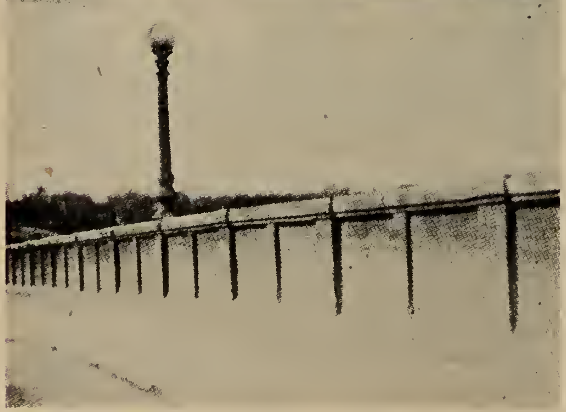


Fig. 1—Showing how faulty concrete was removed, leaving reinforcement
Fig. 2—Network reinforcement added before gunite was applied
Fig. 3—Section of the new parapet.

It was decided by engineers of the railways and the city that the viaduct had suffered no serious damage as yet, but that the action of the acids must be stopped. A contract was given to a firm to clean off the faulty concrete and coat the entire structure with a ½-in. covering of gunite.

The work on the viaduct was handled by two men. They first knocked off all the loose concrete and then applied a sand blast to the exposed surfaces.

After the concrete of the parapet which showed signs of deterioration was removed, leaving the reinforcing rods exposed, a network of new reinforcing was added before the gunite was applied. This is shown in Fig. 2. Fig. 3 shows a section of the new parapet, a solid wall replacing the original open parapet, and illustrates the practical and artistic value of the work of the cement gun.

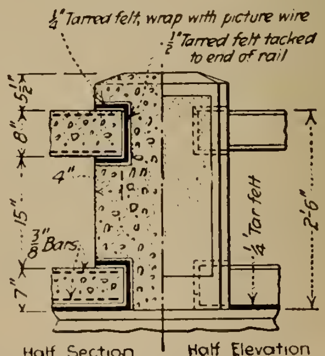
Panels were set the proper distance from the new reinforcing mesh. The railing was then shot 2 in. thick.

The entire structure was gone over, sand-blasted and cleaned, disintegration replaced and columns, beams, slabs and girders coated with gunite. The compressor equipment, consisting of two complete outfits, was located between the tracks below.—Concrete.

Expansion Details for Bridge Railings

Substantial railings are the rule for present-day concrete bridges, and for a beam type, two-span skew structure, with railings continued outward over wing-walls to the limits of the roadway, the expansion movement at end seats and center pier precludes pouring the railing entirely monolithic with rail posts and curbs.

The main feature of the railing design here shown lay in making every third post an expansion point for both sets of entering rails, intervening posts being poured integral with rails. A panel length was adopted such that the larger posts near abutments and pier were expansion points corresponding to joints between deck beams and abutments and wing-walls. The bottom rails in the two panels adjacent to each expansion post were separated from the bridge or wing-wall curb by ¼-in. tarred felt. Freedom of movement of rails in expansion posts was secured by


½" Tarred felt, wrap with picture wire
½" Tarred felt tacked to end of rail
5½"
8"
4"
15"
3/8" Bars
7"
¼" Tar felt
2'-6"
Half Section
Half Elevation

Details of Expansion Post

a tarred felt joint surrounding the sides and the end of the entering portion of the rail. The reinforcing for rails was continuous through those posts without joints.

Precast railing not being advisable for the structure in question, forms for all posts and rails on one side of the roadway were built at a time. After the shores under the bridge deck had been removed, all concrete for the side was poured except in expansion posts. Following a minimum set of four days the form construction in the interior of these posts was carefully removed from around the ends of the entering rails, tarred felt was applied around the bottom set of rails first, and then concrete was poured up to the top rails, whose ends were similarly protected, and the pouring was completed.

By compensating for deck movement and rail expansion proper in every third post, only ten expansion posts were needed for 215 ft. of railing, thus avoiding the questionable construction of an entirely rigid railing on a multi-span bridge while saving in construction time and expense as compared to a design using an expansion joint in every post.—Engineering News-Record.

Link-Belt Acquires Meese & Gottfried Co.

Charles Piez, president of the Link-Belt Company, Chicago, announces the purchase of the Meese & Gottfried Co., of San Francisco, Los Angeles, Seattle and Portland. For the past ten years Link-Belt Company has been distributing its products on the West Coast through its subsidiaries, the Link-Belt Northwest Company, of Seattle, and the Link-Belt Pacific Company, of San Francisco. The improvement in distributing facilities effected by the consolidation, and the additional manufacturing facilities acquired, should give the rapidly-growing industries of the Pacific Coast highly economical and efficient service.

Meese & Gottfried Co., and its predecessors, have been manufacturers of power transmission machinery and distribution of conveying and transmission machinery on the Coast for more than forty years. It is the intention of the new owners, to add to the facilities, and enlarge present stocks, so that prompter service to its customers will be insured.

The new organization will be known as Link-Belt Meese & Gottfried Co., with headquarters at San Francisco. The officials will be: Charles Piez, chairman of the Board; B. A. Gayman, president; Harold H. Clark, vice-president and sales manager; Leslie W. Shirley, treasurer and Richard W. Yerkes, secretary.

Better Mixing Methods Wanted

There is some tendency, states Concrete Highway Magazine, toward the use of six to eight-inch concrete bases for pavements, instead of the four and five-inch thicknesses formerly thought adequate. But as long as mixing and placing methods are permitted which will produce concrete having a compression strength of only 500 to 1,000 pounds per square inch, there is little to be gained by increasing the thickness.

Water Aerated by Spray Nozzles

Aeration by means of fine spray nozzles is being tried at one Pennsylvania water plant for the elimination of tastes and odors due to wood distillation wastes, after experience had shown that ordinary aeration followed by filtration failed to eliminate the disagreeable qualities.

New Books

"Elasticity and Strength of Materials Used in Engineering Construction" (Section 3, Theory of Torsion in Shafting and Double Bending of Plates) by C. A. P. Turner. This section of Mr. Turner's work on the analysis of structural forces deals in a highly technical way with the subjects of torsion and bending. The elementary principles of section 1 are applied to the graphic study of the determination of contours of bulge and depression in shafting and graphic analysis also gives a clear insight into the flexure of plates. Suffice it to say that this volume will have a considerable value to the student who is interested in the theory of structural engineering and who wishes to analyze intimately the causes and results of forces occurring in structural members. The book is published by C. A. P. Turner, at Minneapolis and sells for $5.00.

Trade Publications

Asphalt Construction Described in Circulars

The Asphalt Association, New York City, has issued four circulars dealing with various phases of asphalt pavement construction. The numbers and titles of the pamphlets are as follows: No. 9, "How American Streets Are Paved" (revised to January 1, 1923); No. 22, "Results of the Bates Road Experiments During 1922 with Special Reference to Asphalt Pavements"; No. 23, "Asphaltic Concrete Base Makes Possible Rapid Paving Program; No. 24, "Uses of Asphalt in Highway Construction."

Novo Air Compressors

Bulletin No. 153, on Novo air compressor outfits, has been issued by the Novo Engine Company of Lansing, Michigan. This bulletin features their portable outfits on which there are cooling systems provided for both engine and compressor so that the engine can, if necessary, be used as an independent power plant.

Owen Buckets

Owen buckets, their types and diversified uses, are shown in an attractive descriptive folder issued by the Owen Bucket Company, of Cleveland, Ohio. Three types of buckets are discussed in the pamphlet, accompanied by photos of the buckets in action. A smaller folder deals entirely with type "J" bucket. This bucket, the folder says, is recommended for all general excavating or dredging purposes in materials ranging from loose loam to hard dry clay.

Construction of Concrete Floors

"Concrete Floors" is the title of a new letter-size booklet issued by the Portland Cement Association which gives recognized specifications for the correct construction of floors of the concrete type. Helpful notes and information relating to the subject have been included.

Mainly Constructional

East and West—From Coast to Coast

The contract for the construction of the Windsor and Burlington wharves, in Nova Scotia, has been let to A. E. Cunningham, of Sydney, N.S.

Mr. A. W. Campbell, Dominion Commissioner of Highways, on returning from a 500-mile inspection tour in Quebec and Ontario, reports a large volume of work completed this year and also states that shortages of labor has delayed work considerably at some points.

The first monthly meeting of the Lakes Head branch of the Engineering Institute of Canada was held recently at Port Arthur, with president Burbidge in the chair. Mr. F.H. Keefer delivered an address on Canada's Transportation Problems and dealt more particnlarly with the possibilities of the St. Lawrence route, also outlining the potential power here. It was decided to hold the next meeting at the Kam Club, Fort William, to be preceded by a dinner.

A start on the work of constructing piers for the proposed new steel lift bridge at Prairie Siding, Ont., has been made by the contractors. The proposed bridge will cost in the neighborhood of $125,000.

There is a rumor of a large hotel to cost between $1,000,000 and $1,500,000 in the heart of the business district of Vancouver. A recent report states that all arrangements for the financing of the construction have been completed.

Steps will be taken at once in Vancouver to urge the government to put through a bill at the coming session of the legislature to incorporate the Greater Vancouver waterworks district, it was decided at a conference of the councils of Vancouver, South Vancouver and Point Grey recently.

The builders of Hamilton held the first monthly dinner meeting of the fall and winter seasons, last Friday evening in the Arcade Rose Room. The principal speaker was the Hon. George Lynch-Staunton, who spoke on his recent European tour. These dinner meetings are very popular with the builders of Hamilton and there was a large attendance at last Friday's meetiug.

The Royal Architectural Institute of Canada held its 16th annual two-day meeting on October 9 and 10, at the Windsor Hotel, Montreal. The Province of Quebec Architectural Association arranged an exhibition in the galleries of the Art Association of Montreal, in conjunction with the meeting of the Dominion Association. This exhibition, which will continue to the end of the month, is of interest to the public as well as members of the profession, the articles exhibited including furniture, wood carving, metal work, stained glass and other examples of the work of architects, artists and craftsmen all over Canada.

Tenders will close on October 22 for the new University of British Columbia Library, at Vancouver, B.C. The library will be erected near the Science Building, at an estimated cost of $350,000, and will be of the Tudor style of architecture, cruciform in shape, 120 ft. in length by 100 ft. wide. The building was designed by Messrs. Sharpe & Thompson, London Block, whose plans were accepted from several others submitted in a contest.

Obituary

Mr. Roy Ashton Hamaker, manager of the Montreal branch of the Canadian Johns-Manville Company, and formerly of Rochester, N.Y., was drowned in Lake St. Louis near Montreal, when during a storm that was raging he was swept from his yawl into the water.

Personal

Messrs. Walker & Gibson, architects, Toronto, have moved their offices from 70 Victoria St. to 82 King St. E.

Mr. Fitz-James Bridges has resigned his position as engineer of the London branch of the Department of Public Works and will make his residence in Windsor hereafter. Care of the estate left him by the recent death of his father is responsible for the change.

Mr. R. O. Wynne-Roberts, consulting engineer, Toronto, has been nominated by the Nominating Committee as one of the members of the Executive Committee of the Sanitary Engineering Division of the American Society of Civil Engineers for the year 1924. The other nominated members are, Mr. Harrison P. Eddy, of Boston; Mr. Kenneth Allen, of New York; Mr. Wesley W. Horner of St. Louis, and Mr. Langdon Pearse, of Chicago, all well known United States engineers.

Mr. S. L. Squire has been appointed Deputy Minister of Public Highways of Ontario, succeeding Mr. W. A. McLean, M.E.I.C., who resigned recently. Mr. Squire has long been connected with the good roads movement in Ontario and for the past few years has been chairman of the Executive of the Canadian Good Roads Association.

Mr. S. L. Squire, who becomes deputy minister of highways of Ontario

Mr. H. C. Champ has been appointed Fire Prevention Engineer of the Canadian National Railways, with headquarters at Montreal. Mr. Champ is from Toronto and possesses an experience of seventeen years as a fire prevention engineer in Canada. Previous to his coming to Canada, he served in a similar capacity in the United States. At an early stage of his career, Mr. Champ was engaged in the supervision of construction of large buildings in New York. The office of fire prevention engineer is one of the appointments arising out of the Insurance Department which has been organized by the Canadian National Railways, following the decision of the executive to carry its own insurance. The payment of insurance premiums represented a large outlay and this is now being obviated, insurance being provided for by the establishment of a special sinking fund to be used for the purpose.

Trade Incorporations

Amiesite Asphalt, Ltd., with head office at Montreal, capital $100,000.

L'Entreprise Ltee., with head office at Sorel, P.Q., capital $20,000, to undertake and develop public and private works.

CONSTRUCTIONAL ACTIVITY

Period of October 10 to October 16, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Penetanguishene, Ont.
The town council is having plans prepared for waterworks development. James, Proctor & Redfern, Toronto, Ont., are the engineers.

Etobicoke Twp., Ont.
The town council is having plans prepared for sewage development in Long Branch and Eastwood Park. The engineers are James, Proctor & Redfern, 36 Toronto St., Toronto.

Hespeler, Ont.
Plans are being prepared for waterworks system consisting of auxiliary line 8 in. pipe to cost $2,275, and concrete storage basin at $6,264. The engineer in charge is M. U. Ferguson.

St. Lambert, Que.
Tenders are being received by the city council, through J. Kellett, engineer, until October 22 for manufacturing and delivery of 2,120 ft. of 30 in. internal dia. reinforced concrete pipe and the laying of approximately 2,120 ft. of storm sewers. Plans and specifications with engineer.

Toronto, Ont.
Tenders are being received till October 23, by C. A. Maguire, chairman Board of Control, for construction of following sewers—Henning Ave., Tilson and Millwood Roads.

Tenders are being received till October 23 by C. A. Maguire, chairman Board of Control, for construction of following watermains—Chatsworth Dr., Sheridan, Chudleigh, Cortland and Duplex Aves., and Greer Rd.

Tenders are being received till October 23 by C. A. Maguire, chairman Board of Control, for construction of following drains: Chatham Ave., Phin Ave., Oakdale Ave. and Leslie St.

CONTRACTS AWARDED

Burlington, Ont.
The town council has awarded J. D. Armstrong 871 Main St., contract for sewers in Crosby Ave., from Caroline St. to Lew St. The town supplies the pipe.

Campbellton, N. B.
The contract, to build reservoir dam, has been awarded to J. C. Chatterton, Campbellton, N. B., at $9,550.

London, Ont.
Public Utilities Commission, London, have awarded the London Concrete Machinery Co. the contract for the supply of a reciprocating pump with a capacity of 2,800 gallons per hour, with gasoline engine.

Montreal, Que.
Ogdensburg Coal & Towing Co., awarded the general contract for piers and paving to Bonnel Bros., 341 Guy St., at $8,000.

The city council has awarded the contract for paving to Quinlan, Robertson & Janin, Ltd., at $256,257.

Montcalm, Man.
A. R. Boivin, 304 Notre Dame Inv. Bldg., Winnipeg, has been awarded the contract for roadwork at $28,152.

Port Credit, Ont.
Contract for additions to the water distributing system have been awarded as follows: National Iron Corporation, Toronto, 6 in. and 4 in. cast iron pipes, $12,971. Dominion Wheel & Foundries, Ltd., Toronto, special castings, $575; T. McAvity & Sons, Ltd., St. John, N. B., 6 in. and 4 in. mains, $7,019 70; Gore, Nasmith & Storrie, Toronto, are the consulting engineers.

Point Grey, B. C.
Eugene DePaolo, 205 Pender St. E., has been awarded the contract for roadwork near university site, at $30,000.

Toronto, Ont.
The city of Toronto has awarded the following Contracts for concrete sidewalks; Cloverlawn Ave.—Commissioner of Works; Roselawn Ave.—T. E. Lane, 37 Yorkville Ave., Firstbrook Rd.—Murphy Construction Co.

The following contracts for sewers have been awarded; Hillsdale, Anderson, Oriole Parkway and Lascelles Blvd. $15,653—Kilmer & Barber; Eastbourne, Maxwell, Duplex and Colin Sts $8,958—J. H. McKnight Construction Co.

Vancouver, B. C.
General contract for paving approach to C. N. R. Depot, Main St., has been awarded to Columbia Bitulithic, Ltd., 402 Pender St. W., at $15,200.

Winnipeg, Man.
Work has been started on the Lord Selkirk highway. Contract for the Winnipeg to Emmerson section has been awarded to Bovan Bros.

Railroads, Bridges and Wharves

Baie St. Paul, Que.
Tenders are being received till October 22 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of a wharf in River du Gouffre. Plans and specifications at Dept., at office of district engineer, post office building, Quebec, Que., and at post office, Baie St. Paul.

Bella Coola, B. C.
Tenders will be received till October 30th by the Dept., of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs, Ottawa, Ont., for the construction of an extension and repairs to wharf at Bella Coola, B. C.

New Westminster, B. C.
Tenders will be received till October 30th by the Dept., of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of a pile bent extension 60 x 120 feet to wharf here.

CONTRACTS AWARDED

Algoma District, Ont.
Work is to start shortly on 104 miles of railway construction costing $175,000 for the Algoma Central Railway. Contract for grading has been awarded to McNamara Bros. & Thorton, Queen St., Sault Ste. Marie, and require equipment.

Burlington Centre, N.S.
A. Edward Cunningham, Moore Block, Sydney, has been awarded the general contract for extension to wharf here.

Lanoraie, Que.
F. A. Grothe & Fils, 6 Cuthbert St., Montreal, have been awarded the contract for reconstruction of wharf here.

Smithers, B. C.
Work is to start at once for 59 concrete culverts to cost $85,000 on Smithers division of G. T. P. main line. Jamieson Construction Co. Ltd., Edmonton, Alta., have been awarded the general contract.

Toronto, Ont.
The general contract for reconstruction of east pier of Eastern Channel, has been awarded to Port Arthur Construction Co. Ltd., Toronto, at $48,000.

Windsor, N.S.
Contract for erection of a wharf here has been awarded to A. Edward Cunningham, Sydney, N.S.

Public Buildings, Churches and Schools

Caledonia, Ont.
Bulk tenders are being received till October 25th by the architects, Walker & Gibson, 82 King St. E., Toronto, for general contract and separate tenders for plumbing and heating, in connection with high school to be built here.

Charleswood, Man.
The municipality of Charleswood contemplate the erection of a community hall. 1 storey, frame construction.

Cardston, Alta.
Tenders will be received till October 30 by the deputy superintendent Duncan C. Scott for the erection of a school near Cardston, estimated to cost $100,000. Plans and specifications at Builders Exchange, Calgary, Post Office, Lethbridge. W. W. Graham, Regina; J. F. Flaunt, McLeod, Alta; Inspector of Indian Agencies, Chambers of Commerce, Winnipeg.

Haileybury, Ont.
Tenders are being received till Octo-

ber 22nd by Dept. of Publc Works, through the secretary, H. F. McNaughton, Parliament Bldgs., Toronto, Ont., for heating, plumbing and electric in connection with public school being built. Hill, Clarke & Francis Co., New Liskeard, Ont., are the general contractors.

Tenders are being received till October 22nd by Dept. of Publc Works, through the secretary, H. F. McNaughton, Parliament Bldgs., Toronto, Ont., for heating, plumbing and electric in connection with new separate school. Joseph Sherwood, Haileybury, is the general contractor. Plans and specifications work Clerk of Works, Public Dept., Haileybury, and Department, Toronto.

Hamilton, Ont.

The following contractors are submitting tenders in connection with school to be built on Murray St. W., and want prices on all sub trades: Stuart Bros., 3 Hyde Park Ave.; W. W. Cooper, Clyde Bldg.; P. H. Secord & Sons Construction Co. Ltd., Spectator Bldg., Walter J. Smith, 218 Gage Ave. S.; Frid Construction Co. Ltd., Clyde Bldg.; Pigott Healy Construction Co., 30 James St. S.; Canadian Engineering & Contracting Co. Ltd., 72 James St. N., Hamilton McDonald Engineering Co of Canada Ltd., 1102 C. P. R. Bldg., Toronto.

Mount Royal, Que.

F. G. Robb, architect, 127 Stanley St., Montreal, is preparing plans for a $12,000 church hall for Church of England. Tenders will shortly be called.

Montreal, Que.

Tenders are wanted on plastering in connection with school being built for Parish St. Pierre Claver. Architects, Bernier & Despatie, 294 St. Catherine E.; general contractors, J. C. Frennette, 324 Breboeuf St.

Point Grey, B. C.

Tenders are being received by the Dept. of Public Works, till October 23 for heating, plumbing and ventilation in connection with $750,000 science building for the University of B. C. Architects, Sharp & Thompson, Vancouver; general contractors, E. J. Ryan Construction Co. Ltd., Vancouver.

Tenders are being received till October 22 by the architects, Sharp & Thompson, 904 London Bldg., Vancouver, for library to be built here for the University of British Columbia, estimated to cost $350,000 T. J. Ryan Contractng Co., Ltd., Vancouver, have the contract for foundations.

St. John, N. B.

F. Neil Brodie, 42 Princess St., is preparing plans for $200,000 vocational school.

Toronto, Ont.

J. Robert Page, 18 Toronto St., Toronto, is submitting tenders and wants tenders on all sub-trades and prices on materials in connection with alterations to postal Station "K."

Tenders are being received till October 23rd by the Board of Education, for all trades for addition to school on Lansdowne Ave.

J. Hunt Stanford & Son, architects, 67 Yonge Arcade, are preparing plans for $100,000 theatre north east corner Woodbine and Danforth Aves. W. A. Summerville, 478 Danforth Ave is the owner.

Tenders are being reseived till October 23rd by the Board of Edncation, secretary, W. W. Pearse, 155 College St., for centrifugal pump installation, science tables (cabinet work) for Jarvis Collegiate; iron fencing for Riverdale Technical School. Specifications with architect, 155 College St.

J. Francis Brown, architect, 105 King E., is preparing plans for $50,000 church north west corner Runnymede and Colbeck, for Swansea Baptist Church.

Tenders are being received till October 23 by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Toronto, for alterations to postal station "K". Plans and specifications at Offices of chief architect, Dept. of Public Works, Ottawa, and resident architect, Dept. of Public Works, Ottawa, and resident architect, Dept. of Works, General Post Office, Toronto.

Beaches Branch, G. W. V. Assn., contemplate building a club house at 96 Lee Ave.

Thetford Mines, Que.

The city council contemplates building a $40,000 city hall.

Victoria, B. C.

Tenders are being received till October 25 by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa., for the construction of an office building, Dominion Astrophysical Observatory. Plans at the offices of chief architect, Ottawa., residence architect, Victoria, and Supt. Dom. Bldgs., Vancouver.

CONTRACTS AWARDED

Haterville, N. S.

J. H. Hicks & Son, Bridgetown, N. S., have the general contract and will do all trades for $10,000 church being built for United Church Committee, Waterville. Architect, N. R. Best, Somerset.

Hamilton, Ont.

W. H. Leedham, 81 George St. has the general contract for $12,000 citadel on Wellington W. for the Salvation Army, and will let trades. Tile, stucco and brick construction.

Kitchener, Ont.

Steve Becker, 25 Courtland Ave. E., has the general contract for $10,000 addition to rink for Kitchener Rnk Co.; steel—Hamilton Bridge Works Co., Hamilton. Architects—Schmalz & Jones, 15 Queen St. S.

Montreal, Que.

The contract for foundations for $75,000 church being built for Westmount Baptist Church, has been awarded to Bremner Norris Co. Ltd.

Ulrin Boileau Ltee, 568 Garnier St., have been awarded the general contract at $35,800, for presbytery to be built on Dorion St. Plumbing and heating—O. Caron, 464 Lasalle, Maisonneuve, at $6,450. Architect, E. A. Doucet, 195 St. Cathering E. Associate architect, Ernest Cormier Drummond Bldg.

Cutremont, Que.

The contract for painting and glazing in connection with new hall being built for the Outremont Presbyterian church has been awarded to W. J. Large, 2492 Mance St., Montreal.

Wm. Noseworthy & Son, 165 Egan, have the contract for painting and glazing of school being built on Lajoie Ave. Architect, MacVicar & Herior, general contractors, McRitchie & Black.

Ottawa, Ont.

The foundations are in for $18,000 addition to school on Murray St. Following sub-trades have been let; electric —Mr. Aubrey, care general contractor. H. Dagenais, 158 St. Patrick St.; heating and plumbing—Gauthier & Co.; plastering—Mr. Norman, care general contractor. Painting by day labor.

The general contract for addition to chemical laboratory at Experimental farm has been awarded to Wm. H. McGillivray, 458 MacLaren St., and J. E. Poirer, 440 Clarence St., at $18,202.

St. John, N. B.

H. O. Clark, Water St., has the contract for concrete wall and walls for school on Duke St., and buys material. F. Neil Brodie, 42 Princess St. is the architect.

Selkirk, Man.

Green & Litster, Ltd., 236 Fort St. Winnipeg, have been awarded the general contract for steam piping and auxiliary machinery to cost $12,303, for Hospital for Mental Diseases.

Sydney, N.S.

Hagen & Co., 452 George St., have the contract for plumbing and heating of $35,000 community hall being built for Presbyterian and Methodist Missions. Chappells Ltd., 62-80 Brookland St., have the general contract.

Toronto, Ont.

The contract for carpentry in connection with college buildings being erected on Hoskin Ave., has been let to Dickie Construction Co., Ryrie Bldg.

Tavistock, Ont.

Nicholas Lichti, Waterloo, Ont., has the contract for concrete work for skating rink and assembly hall to cost $12,600 or Tavistock Rink Co., Ltd. Geo Kneisel is the architect. General contractors, Zimmerman Bros., Ltd.

Timmins, Ont.

The following sub-trades have been let on $80,000 high school being built; steel—Hamilton Bridge Works Co. Ltd.; ornamental iron—Mahaffy Iron Works, Toronto; art Stone—Casper Baum, Kitchener; ventilating plumbing and heating—A. Brazeau; electric—E. M. Allworth Both of Timmins. Roofing, electric, plumbing, heating, plastering, painting, sheet metal and tiling to be let by general contractors, Schultz Bros. & Co., Ltd., Brantford. Architects, Pennington & Boyde, Windsor, Ont.

Windsor, Ont.

Crawford & McGaw, 743 Dufferin Place, has the contract for plastering of $160,000 separate school on Campbell Ave. General Contractors, Muxlow & Gale, 1342 Howard Ave; architect, G. J. P. Jacques, 3 Ouelette Ave. Terrazzo and mastic to be let.

Winnipeg, Man.

Boland Bros., 415 McIntyre Block, have the general contract for $13,000 repairs to Cornish Baths.

Business Buildings and Industrial Plants

Ahuntsic, Que.

Canada Chemical Works Co., Ltd., 39 Depatie, contemplate building a factory here. Work will probably go ahead next spring.

Halifax, N. S.

Tenders are being received till November 7, by the Dept. of Trade & Commerce, through the deputy minister, F. C. T. O'Hara, Parliament Bldgs., Ottawa, Ont., for grain elevator and conveyors to cost $1,200,000. Plans and specifications with deputy minister. An accepted bank cheque or funds for $50,000 required.

Kitchener, Ont.
J. C. Klaehn, industrial engineer, 59 Irwin St., is preparing plans for alterations and addition to packing plant costing $100,000 for the Schneider Packing Co. Building will not be started until next spring.

La Tuque, Que.
Pierre Levesque, architect, 115 St. John St., Quebec, Que., is preparing plans for alterations to brank branch to cost $200,000, for La Banque Nationale, of Quebec, Que.

Montreal, Que.
Montreal Bridge Co. Ltd., Lachine, Que., are supplying the structural steel in connection with repairs to garage at 195 Mountain St., owned by the Bell Telephone Co. Cook & Leitch, 358 Beaver Hall Hill, are the general contractors. Roofing to be let.

The foundations are going in for $18,000 public garage on Boyer near Gilford. Senecal & Theoret, 288 Boyer, are the owners and builders. Roofing, plumbing and heating to be let.

Mimico, Ont.
J. Robert Page, 18 Toronto St, Toronto, is submitting a tender and wants prices on all sub-trades and materials for $20,000 bank to be built for Bank of Montreal.

Maple Ridge, B. C.
The Hammond Cedar Mill Co., are erecting a $15,000 mill and storage shed.

Ottawa, Ont.
Tenders are being received by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for addition to ore dressing laboratory. Plans and specifications with chief architect, Dept. of Public Works, Central Experimental Farm, Ottawa.

Tenders are being received by the general contractor, J. B. Daust, Westboro Rd., no closing date set, in connection with $14,000 garage on Wellington St. for D. Charleboise, 691 Wellington St.

Orangeville, Ont.
D. C. Cotton, architect, 54 Adelaide East, Toronto, is preparing plans for a $55,000 factory for the manufacture of automobile tops. The owners are Taylor & Loree, care W. C. Taylor, 911 Bathurst St., Toronto.

Prince Rupert, B. C.
New plans are being prepared by Arthur Cox, Birks Bldg., Vancouver, for $55,000 hotel, and tenders will shortly be called.

St. Jerome, Que.
H. Potvin, architect, 26 St. James St., Montreal, is preparing plans for additions and alterations to hotel to cost $40,000, for A. Arbour, St. Jerome.

Toronto, Ont.
F. G. Soper Co., Ltd., 200 Laughton Ave., contemplate building a factory at 208 Laughton Ave. for the manufacture of window shades. Work will start in the near future.

Ashley Woodburn, 89 Willow Ave., is preparing plans of a refrigeration plant for abattoir, and wants information concerning insulating and waterproofing material and refrigeration plant equipment. Reinforced concrete construction.

R. Dack & Sons, Ltd., 73 King West, have purchased a 4 storey building at 124 Adelaide W. and will occupy as a shoe factory about the end of this year. Will make alterations. W. G. Hunt, Confederation Life Bldg., Toronto, is the architect.

Tenders are being received by the owners, R. G. Henderson & Son, 42 Yorkville Ave., for general contract for addition to workshop rear 42 Yorkville Ave. Plans and specifications with owner.

Canadian Pad & Paper Co., 520 King W., have purchased a site on Spadina Rd. for the erection of a factory.

Tenders are being received by the owners, Toronto Carpet Mfg. Co., 1179 King W., on roofing, plumbing, plastering, painting and tinsmithing for dye house and manufacturing building being erected at 1179 King W. Wm. Steel & Son, Ryrie Bldg., are the architects.

Frank W. Urquhart, 15 Raglan Ave. is the owner of 21 private garages, $5,000 each, being built on Davenport Rd. 1 storey, brick construction. Work by day labor.

Vancouver, B. C.
John Brown, architect, is preparing plans for a $100,000 sawmill for the B. C. Cedar & Fir Co., Ltd., Vancouver, to replace recent fire loss.

CONTRACTS AWARDED

Brockville, Ont.
Geo. Ross & Son has the contract for heating, and Geo. Barclay, 73 Bartholomew St. the contract for plastering, in connection with $18,000 garage being built corner George and Chase Sts. for G. R. Quirmback, King W. E. Parslow, Maple St., is the general contractor.

Brantford, Ont.
P. H. Secord & Sons Construction Co., Ltd., have the general contract for warehouse, office and garage costing $15,000 on Burford Rd. for British American Oil Co., Ltd. W. A. T. Shorman, care owners, is the consulting engineer, who will let the heating.

East St. John, N. B.
J. H. Pullen, Horsefield St., St. John, has been awarded the contract for glazing in connection with power house for St. John Dry Dock & Shipbuilding Co.

Ford, Ont.
A. W. Carmichael Co., Ltd., Walkerville, have the contract for roofing and sheet metal for coal bunker building for the Ford Motor Car Co. of Canada. Albert Kahn Ltd., are the architects. Jno. V. Gray Construction Co., Windsor, Ont., have the general contract.

Windsor Construction Co., Ltd., Walkerville, Ont., have been awarded the general contract for $35,000 bank building for Provincial Bank of Canada, Montreal. Architect, G. P. J. Jacques, Windsor.

Hamilton, Ont.
Medley Bros., Brennen Apartments, have the general contract for $15,000 store building corner King and Marcon Sts., Westdale, for McKittrick Properties, Ltd.

Jas. R. Ibister, 125 Wellington S., has the general contract for a garage on Jackson St. E., for the Hamilton Taxicab Co. and will let trades.

Kentville, N. S.
J. H. Hicks & Son, Bridgetown, N. S., have the general contract for $8,500 apple warehouse for Hothard & Lowe, Kentville. A. E. Hicks, Bridgetown, N. S., is the architect. General contractor will do trades.

Lauzon, Que.
Joseph Dorval, Lauzon, Que., has the general contract for $15,000 joiner's shop for the Davie Shipbuilding & Repairing Co. Ltd. Owner wants quotations on special machinery for joiner's shop.

Montreal, Que.
N. Fortier, 3341 Adam, is the owner and builder of $18,000 addition to garage at 3099-3103 Notre Dame E. Masonry—F. X. Robbillard, 12 Cadillac, structural steel—Phoenix Bridge & Iron Works. Roofing, electric, plumbing and heating to be let.

The steel is going up for $1,500,000 addition to telephone exchange corner Ontario and St. Urban Sts., for Bell Telephone Co. Structural steel; Dominion Bridge Co., Ltd., Lachine, Que.; electric—Canadian Comstock Co.

Hobbs Mfg. Co., Ltd., 444 St. James St., have the contract for glazing in connection with $25,000 molasses distillery being built for Commercial Alcohol Co. Architect, F. Robb; general contractors, Bonnel Bros., 341 Guy St. Painting to be let.

H. G. Vogel Co. (Canada) Ltd., have the contract for tiling and sprinkler system, and Metal Shingle & Siding Co., Ltd., the contract for doors, in connection with $500,000 offices and warehouse on Ontario St. E. Federal Construction Ltd., are the owners and builders. Ornamental iron to be let. Roofing day labor by owners.

Ottawa, Ont.
The following contracts have been awarded in connection with $300,000 building being built for Bank of Nova Scotia; steel—McGregor & McIntyre, Toronto; ornamental and miscellaneous iron; Architectural Bronze & Iron Works, Toronto. Plastering and painting to be let. General contractors—Carswell Construction Co., Ltd., Toronto. Architect—John M. Lyle, 230 Bloor W. Toronto.

Port Colborne, Ont.
E. G. M. Cape Co., 10 Cathcart St., Montreal, have been awarded the contract for storage annex to elevator here.

Regina, Sask.
J. G. Traub & Sons, 2105 Rae St., Regina, have the general contract for alterations and addition to store costing $13,000 on Tenth St. for Furhman & Co., 1501 10th Ave. Storey & Van Egmond McCallum Hill Bldg., are the architects. Plumbing heating, electric and millwork not let.

Ridgeway, Ont.
The following sub-trades have been let on $67,000 club house for Cherry Hill Club: carpentry—Hanna Bros., Bridgeburg, Ont., at $52,000; plumbing and heating—Jno. W. Danforth, Ellicott Sq., $15,000. The architects are Wicks & Hopkins, 110 Franklin St., Buffalo, N.Y.

Sarnia, Ont.
The brickwork is going up for $35,000

office and stores corner Victoria and Lochiel, for Garden Bros., Lochiel St. Architect, Chester Woods, 217½ Christina St.; brickwork—R. B. Murray, 122 Vidal St. S., millwork—Laidlaw-Belton Lumber Co. Balance of work day lobor.

Simcoe, Ont.

McKinney & Co., Woodstock, Ont., have the contract for carpentry work, and Davison & McInnis, Woodstock, Ont., the contract for sheet metal, electric, heating and plumbing, on $25,000 addition to plant of City Dairy Co., Ltd. James A. Vance, Woodstock, is the general contractor. Engineers are Gore, Nasmith & Storrie, Toronto.

Truro, N. S.

McKenzie Bros., Truro and and New Glasgow, have the general contract for 2 stores on Inglis St., costing $30,000, for W. J. Fraser, St. John.

Toronto, Ont.

The following sub-trades have been let on $30,000 addition to manufacturing building, 26 Noble St., occupied by Ferranti Meter & Transformer Co.; masonry—Teagle & Son.; roofing—W. E. Dillon & Co., Ltd.; steel—Reid & Brown; sash—Canadian Metal Window Co.; plumbing—W. H. Booth, 365 Dovercourt Ro.; painting—Linington Connell Co., Ltd.; heating—Jos. Harrison, care architect, Vaux Chadwick, 132 Church St.

Douglas Bros., 124 Adelaide W. have the contract for roofing, and Barton & Dillon, 2 Monteith St. contract for painting in connection with remodelling of Y. W. C. A. Headquarters costing $125,000. R. G. Kirby, 539 Yonge St. is the general contractor. Architects, Molesworth, West & Secord.

Timmins, Ont.

E. M. Alworth has the contract for electrical work, and J. S. Shields, contract for painting on $35,000 office building being built for Hollinger Gold Mines. J. S. Archibald, 326 Beaver Hall Hill, Montreal, Que., is the architect. Plastering to be let.

Woodstock, N. B.

Forbes & Brown, Devon, N. B., have the general contract for $10,000 garage on Carleton St., for Phillips Pringle, Ltd. Architect, G. Wilson, 50 Princess St., St. John, N. B.

Windsor, Ont.

Windsor Electric Shop have the contract for electrical work, and J. S. Seiber London St. the contract for plumbing and heating, for 3 stores being built on Oulette Ave. at a cost of $12,000, for A. A. Little, Pitt St. W. Fred Prince, 208 Davis Bldg., has the general contract. Plastering to be let.

Residences

Dorval, Que.

K. G. Rea, architect, 285 Beaver Hall Hill, Montreal, Que., is preparing plans for $25,000 addition to residence for J. W. McConnell. Contract will be let shortly.

Limoilou, Que.

Wm. Morel, 16 LaCanardiere Rd., is the owner of 3 family residence being built on LaCanardiere Rd. costing $9,000. Work by day labor.

London, Ont.

A. Nichol, 190 Garfield Ave., is the owner and general contractor of 2 residences costing $9,000 on Tecumseh Ave.

Montreal, Que.

The foundations are going in for 2 residences costing $16,000 on Davidson corner Adam. A Longpre, 410 St. Germain, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

O. Duquette, 1173 Boyer, is the owner and builder of $9,000 residence on Clarke, near Gouin Blvd. Architect, H. Potvin, 26 St. James St. Brickwork, millwork, roofing, electric, plumbing, heating and plastering to be let.

M. Maron, 1195 St. Urbain St., is the owner and builder of a $60,000 apartment house near 462 McKay St. H. Potvin, 26 St. James St., is the architect. All trades to be let. Owner buys materials.

T. Labelle, 3528 Christophe Colomb is the owner and builder of $10,000 residence near 1290 Christophe Colomb. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

The foundations are going in for $9,000 residence on St. Lawrence Blvd., near St. Zotique. A. B. Cana, 3036 St. Lawrence is the owner and builder. Roofing, electric, plumbing and plastering to be let.

The foundations are going in for 2 residences costing $12,000, on Lafontaine, between Bennett and Aird. W. Galipeault, 162 Bourbonniere, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

A. Cavtin, Lachenaie, Que., is the owner and builder of 2 residences on De La Roche, between St. Zotique and Belanger, to cost $12,000. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Foundations are going in for 4 residences to cost $25,000, on Old Orchard between Monkland and Terrebonne. S. W. Ogilvie, 23 Grey Ave., is the owner and builder. Brickwork, millwork, roofing, electric, plastering and painting to be let. Plumbing and heating, day labor.

Foundations are in for $15,000 residence on St. Denis, between 34th and 35th Aves. A. Giguere, 402 St. Catherine E., is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering and painting to be let.

The foundations are going in for $9,000 residence on Lafontaine, between Aird and Bennett. A. Caplette, 188 Orleans, is the owner and builder. Masonry, millwork, roofing, electric, plumbing, heating and plastering to be let.

The foundations are in for 2 residences costing $10,000 on 1st Ave., between Beaubien and St. Zotique. A Pineault, 208 Champ de Mars, is the owner and builder. Masonry, millwork, roofing, electric, plumbing and plastering to be let.

Tenders are being received on all trades in connection with $15,000 residence being built corner Queen Mary and Finchley Road. Plans and specifications with owner, J. T. Stanger & Co., 10 St. John St., Montreal, and supervisor of building, C. Thompson, care H. S. Taylor & Co., 285 Beaver Hall Hill, Montreal.

Outremont, Que.

The walls are going up for 3 cottages to cost $25,000, on Wiseman, corner St. Justine. Louis Tarlton, 393 Wiseman, is the owner. Roofing, electric, plumbing, heating, plastering and tiling to be let.

Point Grey, B. C.

C. J. Phillips, 2654 Seventh Ave. W., is the owner and builder of $11,000 residence at 1826 King Edward Ave. Architect, R. W. S. Chadney, 709 Northwest Bldg., Vancouver. Electric, plumbing and heating not let.

Kerrisdale Home Builders, 1661—49th Ave. W., are the owners and builders of 2 residences, $7,000 each, corner 49th and Angus Ave. Architect, R. T. Perry, 405 London Bldg., Vancouver. Electric, plumbing, heating and plastering not yet let.

Vancouver, B. C.

Heggen & Johanson, 779—25th Ave. E., are the owners and builders of 2 residences, $4,500 each, on Barclay St. Electric, plumbing, heating, and painting not let.

Westmount, Que.

R. Charbonneau, architect, 194 G. E. Cartier Sq., is preparing plans for an apartment house corner Olivier and Sherbrooke E., and will call tenders in about two weeks. Versailles & Vidricaire, 90 St. James, are the owners.

Winnipeg, Man.

C. T. Lount, 501 Union Bank Bldg., is the owner and builder of $12,000 residence, east side Waverley, near Kingsway. Owner buys materials and will let sub-trades.

Toronto, Ont.

Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., on plumbing and heating for $9,500 duplex residence being built at 742 Coxwell Ave. Electric, plastering and painting still to be let.

Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., Toronto, on brickwork (labor only) for $15,000 residence on Russell Hill Rd., near Frybrook Ave. Carpentry by day labor.

The walls are going up for 2 residences, $10,000 each, at 74-76 Dawlish Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Tenders are being received by owners on plumbing and hot water heating. Plastering and painting still to be let.

Excavation work has started for 3 bungalows, $4,500 each, at 240-2-4 Caledonia Ave. Jno. Pountney, 115 McKay Ave., is the owner and builder. Heating, electric, painting, plastering and plumbing trades to be let.

Eli Elliott, 29 North Markham St., is the owner and builder of 2 residences, $4,500 each, on west side Harvey Ave., near Ascot. Tenders being received on plastering, electric, heating and plumbing. Painting by owner.

Tenders are being received till October 26 by the architects, Kaplan & Sprachman, 298 Dundas W., for excavation, brickwork, stone, concrete work and carpentry work for $125,000 apartment house to be built south west corner Homewood Ave. and Wellesley Cres.

Plans and specifications with architects. D. Lavine, care architects, is the owner.

Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., on plumbing and heating for $9,500 duplex residence being built at 744 Coxwell Ave.

C. R. Holmes, 85 Gormley Ave., is the owner of $10,000 residence being built north side Inglewood Drive, near Lighthill Ave. Tenders are being received by the owner on plumbing, electric, painting, plastering and heating.

Footings are in for 1 pair residences, $4,500 each, north side Norman Ave., near Caledonia. J. S. Bothwell, 466 Silverthorn, is the owner and builder. Carpentry and masonry by day labor.

The walls are going up for $15,000 duplex residence at 216 Howard Park Ave. J. C. Rayner, 292a Runnymede Rd., is the owner and builder. Masonry by day labor. Tenders are being received on plumbing, electric, painting, plastering and heating.

The footings are in for 2 duplex residences to cost $25,000, east side Keele St., south east corner Valley Crescent. J. Ewing, 1625 Bloor W., is the owner and builder. Roofing, plumbing, electric, painting, plastering and heating to be let.

G. S. Sanderson, 291 Indian Rd., is the owner and builder of $15,000 residence and garage, east side Indian Grove, near Indian Valley Crescent. Electric, painting, plastering and heating to be let.

Wm. J. Wingrove, 141 Waverley Rd., is the owner and builder of 3 residences costing $22,000, on east side Evans Ave., near Ardagh. Electric, painting, plastering, heating and plumbing to be let.

Farny & Forbes, 564 Rhodes Ave., contemplate building 5 pair residences, $7,000 pair, on west side Rhodes Ave. and S. S. Hanson Ave. 2 stories, shingle and brick construction.

The walls are going up for $9,500 residence north side Wanless Ave., near Preston Rd. W. E. Coldwell, 73 Jackman Ave., is the owner and builder, and employs regular staff and buys material as required. Carpentry and masonry day labor.

Tenders are being received by the architects, Kaplan & Sprachman, 298 Dundas W., for excavating and erecting 3 cellars in either concrete, concrete block or brick, for 3 residences on Davisville Ave., to be built for the Dominion Wrecking & Construction Co. Plans and specifications with architects.

Wm. Pugh, 1252 Broadview Ave., has the contract for masonry, and McGregor & McIntyre, Ltd., the contract for steel in connection with 3 stores and apartments north side Danforth near Caithness Ave. S. H. Lumb, 31 Oakdene Cres., is the owner and builder. Electric, painting, plastering, heating and plumbing to be let.

Jackson & Hamilton, 54 Bastedo Ave., are the owners and builders of 1 single and 1 pair residences to cost $9,000 on south east corner Hanson and Hilingdon Ave. Plastering, painting, electric, heating and plumbing to be let.

Robson & Teasdale, 15 Wiley Ave., contemplate building 5 residences on west side Inwood Ave., to cost $4,000 each; 2 stories, stucco and brick construction.

J. R. Wilcox, 609 Oakwood, is the owner and builder of 1 pair residences, $4,500 each, south side Eglinton, near Oakwood Ave. Electric, plastering, painting, heating and plumbing to be let.

E. G. Ross, 2597 Eglinton Ave. W., is the owner and builder of 2 residences, $4,500 each, west side Graham Rd., near Eglinton. Electric, plastering, painting, heating and plumbing to be let.

Tenders are being received on heating, plumbing, plastering, electric and painting on 2 pair residences costing $26,500, east side Springmount Ave., near Rosemount. Geo. B. Patton, 36 Regal Rd., is the owner. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects.

Work is to start at once for 2 residences costing $20,000, east side Springmount, near Regal Rd. Geo. B. Patton, 36 Regal Rd., is the owner. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade. Tenders are being received on heating, plumbing, plastering, electric and painting.

W. H. Little, 53 Russell Ave., is the owner and builder of 1 pair residences, $6,000 each, west side Dorval Rd., near Wanda Ave. Heating, electric, painting, plastering and plumbing to be let.

Wm. Jones, 68 Belsize Drive, is the owner and builder of 2 residences, $5,000 each, north side Millwood Rd., near Mt. Pleasant. Owner employs regular staff and buys material as required.

Separate tenders are being received by the general contractors, A. R. Burk & Co., 18 Toronto St., on all trades including carpentry and masonry work (labor only), for $15,000 residence on Russell Hill Rd., near Frybrook Rd.

CONTRACTS AWARDED

Hamilton, Ont.

Mitchell & Riddell, 46 Head St., have the general contract for $20,000 residence corner Queen and Glenfern, for Robt. Mills, Queen St. S., and will let trades. Architects, Hutton & Souter, Bank of Hamilton Bldg.

James Crombie, 71 Ottawa N., is the owner and general contractor of 2 residences costing $10,000 corner Ottawa and Maple Aves. Plumbing and heating —A. E. Fletcher, 267 Prospect St.

Halifax, N.S.

C. A. Leverman & Co., 135 Walnut St., has the general contract for alterations and addition to residence on Tower Road to cost $12,000, for F. B. McCurdy, 182 Tower Road.

London, Ont.

The following sub-trades have been let on $15,000 stores and apartments being built corner Wharncliffe Rd. and Elmwood Ave.; plumbing and heating—E. G. DePotie; electric — Lavender Electric Co.; roofing—Arthur Mould; metal store fronts and plate glass—Consolidated Plate Glass Co. of Canada, Ltd., Toronto.

Montreal, Que.

Z. Heroux, 1641 St. Denis St., has the general contract for stores and flats being built on north west corner Sherbrooke and Oxford Ave., for P. E. Bourret, 294 St. Catherine St. E. Millwork, roofing, electric, plumbing, heating, plastering, painting, glazing and tiling to be let. General contractor buys materials.

A. Dore, 109 St. Ferinand St., has the contract for excavation work, and Jules Toralli, 186 St. Margaret St., the contract for foundations for stores and flats north east corner Gray and Sherbrooke for Nathan Shribman, 5056 Sherbrooke W., the owner. Architects, Shorey & Ritchie, 360 Beaver Hall Hill. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting, glazing and tiling to be let. Owner buys materials.

Chas. Egan, 3326 Verville St., has the contract for electrical work on $15,000 residence being built on Mance, between Bernard and St. Viateur. J. Gilletz & Co., 1188 City Hall, are the owners and builders. Roofing, painting and glazing to be let.

The following sub-trades have been let on $12,000 residence near 1062 St. Denis: masonry—A. Gagnon, 27 Belanger St.; roofing and plumbing—J. A. Vaillancourt, 1301 St. Denis; electric, Mr. Bergeron, Berri St. G. Martineau, 1670 St. Lawrence Blvd., is the general contractor.

O. Deguire, 621 Casgrain, is the builder of 2 residences costing $10,000 on Jules Verne, between St. Laurent and Casgrain for Mrs. O. Deguire, 621 Casgrain. Brickwork, millwork, roofing, electric, plumbing and plastering to be let. Builder buys materials.

New Westminster, B. C.

J. K. Sinclair, 1662 Barclay St., Vancouver, has the general contract for $20,000 residence on Queen's Ave., for C. J. Cutler, 1015 Hamilton St. Architects—Townley & Matheson, 325 Homer St., Vancouver. Electric, plumbing, heating and plastering not yet let.

Ottawa, Ont.

Contracts for $17,000 apartments being built corner Clarence and Cobourg Sts. have been awarded as follows: electric —Marchand Electric Co.; heating and plumbing—Mr. Archambault, Hull, Que.; plastering—Mr. Tessier, Loretta St.; painting—Mr. Leval, care owner, Asias Sauve, 38 Rideau St. Architect—R. Rouleau, care owner.

Capital Contractors, Ltd., 233 Jackson Bldg., have the general contract for $10,000 duplex residence on McLeod St. for C. Armstrong, care general contractors. No materials purchased.

R. W. Janes, Creighton apartments, has the general contract for $25,000 apartment house being built corner Wellington and Holland Aves., for Wm. Joynt, Laurentian View, near Ottawa. No materials purchased.

Port Colborne, Ont.

Geo. Hampson, 18 Jones St., St. Catharines, Ont., is the builder of 8 residences, $2,500 to $3,000 each, for Bell, Woodin & Fry, care of builder. No material purchased.

St. Lambert, Que.

R. J. Williams, 13 Prince Arthur St., has the contract for plumbing and heating in connection with $8,800 residence being built on Pine St. for Modern Housing Co., owners and general contractors.

Sandwich, Ont.

J. L. Seiber, London St., has the contract for plumbing and heating $12,000 residence being built on Partington Ave. for F. Prince, Davis Bldg., Windsor,

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Temiskaming and Northern Ontario Railway Commission

Sealed tenders addressed to the undersigned will be received at the office of the Commission, North Bay, Ontario, up to twelve o'clock noon of

Thursday, November 1st, 1923,

to provide a rate or rates for fire insurance purposes on the whole, or portion of Commission's property for periods of one year, and three years respectively, from December 1st, 1923, next.

Upon application, a printed schedule of items and valuations will be furnished for this purpose.

Dated at North Bay, this 8th day of October, 1923.

W. H. MAUND,
Secy. Treasurer.

42

City of St. Lambert

Tenders Wanted

Tenders will be received at the City Hall, St. Lambert, up to 5 P. M.,

Monday, October 22nd, 1923,

for:

The manufacture and delivery of 2120 feet of 30-inch Internal Diameter Reinforced Concrete Pipe.

The laying of approximately 2120 feet of Storm Sewers.

Plans may be seen and specifications had at the office of the undersigned.

The lowest or any tender not necessarily accepted.

By Order of Council

(SGD.) I. KELLETT,
City Engineer.

42

NOTICE TO HEATING, PLUMBING AND ELECTRIC CONTRACTORS

The time for receiving tenders for Heating, Plumbing and Electric Wiring, Court House, Port Arthur, is

extended to October 20th, 1923,

by order.

H. F. McNAUGHTON,
Secretary, Public Works
Department, Ontario.

Toronto, 12th October, 1923. 42

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Alterations to Postal Station "K", Toronto, Ont.," will be received until 12 o'clock noon,

Tuesday, October 23, 1923,

for alterations to Postal Station "K", Toronto, Ont.

Plans and specifications can be seen and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, and the Resident Architect, Department of Public Works, General Post Office, Toronto, Ont.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, October 8, 1923. 41-42

DEPARTMENT OF ROADS

Tender for Bridges

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender for Bridges," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon, on

Thursday, the eighth (8th) of November, 1923,

for the construction of a Concrete Bridge over the Red Creek, on Montreal-Sherbrooke Highway, in the municipality of Petit Lac Magog and for construction of concrete bridges over Petit Pre, Casault and Lemoine rivers, on Quebec-Saint-Simeon Highway, in the parish of Chateau Richer.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

Quebec, October 16th, 1923.

J. L. BOULANGER,
Deputy Minister.

42

Business Opportunity

A well established contracting and building firm desires to expand. Has work ahead and in view that will be very profitable. Solicits correspondence with contractor, builder or other parties with good financial standing. Apply Box 399, Contract Record, Toronto. 42-45

Dredge for Sale

All steel machine, ¾ yd. dipper, 30 ft. steel boom, 30 ft. steel axles, 35 H.P. Gas Engine. O. M. Loyer, 119 Harvey St., Chatham, Ont. 42-44

Machinery for Sale

20-ton Standard Gauge Industrial Locomotive Crane, mounted on 8 wheel M. C. B. Steel Car, enclosed steel cab, 50 ft. steel boom with 20 ft. extension.

2—1-yard clamshell buckets, newly rigged. Boiler, etc., in A1 condition. Box 390, Contract Record, Toronto. 40-43

Equipment for Sale

by

The Corporation of the City of Victoria B. C.

The Corporation of the City of Victoria, B.C., has for sale certain equipment used in the construction of the Johnson Street Bridge. The material for sale is as follows:

1 Land Derrick complete (less engine).
2 1 yard Concrete Buckets.
1 1 yard Smith Concrete Mixer and 9 x 9 Wache Vertical Steam Engine direct connected, also Hopper, Galvanized Iron Cylinder, Pipe and Fittings from Boiler.
1 Vertical Boiler, 25 H.P., 42 x 96, 148 lbs. working pressure will all fittings and Stack.
2 Cement Blowers.
1 Scow 27 x 90 with Sheds and Timberwork.
1 7 x 10 Double Drum Hoisting Engine. Timber Work for underwater Concrete guides also skid for 7 x 10 Engine.
1 12" Vertical Centrifugal Pump with 40' Shaft, Bearings, Guides, etc., also Timber Work.
1 12 x 8 Atlas Steam Engine.
1 piece 16" Double Leather Belt, etc. { 48 ft. Rubber
  40 ft. Balatta Type
  22 ft. Leather
1 72 x 108 Vertical Boiler.
1 No. 1 Union Iron Works Steam Hammer.
1 Diving Outfit complete, Pump, Scow, etc.
3 Diving Suits.
1 Derrick Scow complete, equipped with 9 x 10 American Hoist and Derrick Engine, also swinging Engine and all Fittings including Ejector, Westinghouse Air Compressor.
1 1-Yard Orange Peel Bucket.
1 Small Scow.

For further particulars and prices apply to the City Purchasing Agent, City Hall, Victoria, B.C.

E. S. MICHELL,
Purchasing Agent.

42-45

POSITION WANTED BY FOREMAN CARPENTER. Experienced in factory work. Good draughtsman. Box 400, Contract Record, Toronto. 42

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-42

SITUATION WANTED BY ARTIFICIAL STONE EXPERT whose 14 years experience covers every detail of the stone business—estimating, pattern-making and stone-making. All classes of work from blocks and posts to the highest class of architectural stone. Box 402, Contract Record, Toronto. 42-44

Saw Mill for Sale

Complete heavy portable mill, plenty of power, first class condition. 400 cords mixed slabs. Reasonable cash offer accepted. Fallon Brothers, Cornwall, Ont. 42

For Sale—$350.00

One used Concrete Mixer 12 cu. ft. dry capacity. Power tilting drum type, with side loader and gasoline engine thoroughly overhauled. K. W. Lewis, 105 Front St. E., Toronto, Ont. 41-42

Gravel Pit for Sale

Gravel, large proven deposit, low in sand and oversize, high in half inch and inch; abundance of water for washing; forty miles from Toronto; railroad through property can be bought at approximately farm value, or would lease. Box 401, Contract Record, Toronto. 42

For Sale

Model 28—Marion Steam Shovel with clamshell attachment.
1—No. 2 Mitchell Jaw Crusher (new)
Several screen sections, 48" standard Austin screen.
1—2½" Centrifugal Pump.
1—60 H.P. Locomotive type boiler.
1—60' Barber Green Portable Conveyor.

Above equipment may be seen at our quarry at Hagersville, Ontario.
Hagersville Quarries Limited, 4 Flora Street, St Thomas, Ont. 41-43

Plant for Sale

20 lb. Steel Rails, 300 tons
Rock Cars, Trucks and Boxings
Western Dump Cars, 1½ yds. capacity.
Wheel Scrapers
Slush Scrapers
Railroad Plows
Solid Drill Steel 1" octagonal
2—Wettlaufer 1/3 yd. Mixers, steam.
1—Smith ½ yd. Mixer, steam
4—Wettlaufer No. O Power Gasoline Mixer.
1—Ingersoll Rand Hoist with boiler, 2 drum with boom swinger 8 x 10 on skids.
1—Marsh-Henthorn Hoist with boiler, 2 drum with swinger on skids.
1—Beatty double drum 7 x 12, with boiler 26" x 6' 6", 1 nigger-head on rear drum mounted on skids.
3—Steam Centrifugal Pumps, 4 x 5 and 5 x 6.
1—Diving outfit complete, pump, suit, 120 ft. hose.
3,000 pair Blankets.
Cookery Outfit.

Apply to Box 375, Contract Record, Toronto. 37-42

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

Residences

(Continued from page 53)

Ont., owner and general contractor. Electric and plastering to be let

J. L. Seiber, London St., has the heating and plumbing contract for $14,000 duplex residence on Partington Ave. Prince Bros., Windsor, Ont., are the owners and general contractors. Electric and plastering to be let.

Sydney, N. S.

Hagen & Co., 452 George St., have the contract for plumbing and heating of $12,000 residence being built on Kings Road for M. A. Doak. General contractors are Chappells Ltd., 62 Brookland St.

Toronto, Ont.

Albert Holmes, 1050 Dovercourt Rd., is the builder of store and apartments east side Dufferin St., near Rogers Rd., to cost $10,000, for Marshall Bros., 120 Van Horne St. Tenders being received by general contractor on roofing, painting, electric, plastering, heating and plumbing.

W. S. Honeycombe, .124 Yarmouth Rd., has the contract for heating of $25,000 residence on Forest Hill Rd., being built for H. H. Horsfall, Leaside. Architects — Edwards & Edwards, 18 Toronto St.

W. F. McCutcheon, 34 Northcliffe Blvd., is the builder of 1 pair residences, $4,500 each, at 83-85 Marchmont Rd. Electric, heating and plumbing to be let.

The foundations are in for $9,000 residence north side Garfield Rd., near McLennan Ave. P. Mueller, 52 Warren Rd., has the general contract and is supervising all work J. D. McCarter, 2 Lonsdale Rd., is the owner. Plastering, painting, electric, heating and plumbing to be let by general contractor.

Robt. Morse, 1326 Ossington Ave., has the contract for painting, and J. Cudmore, care owner and builder, Duncan Munroe, 65 Lawton Blvd., the contract for plastering in connection with 4 residences, $9,000 each, being built on east side Dunvegan Rd., near Forest Hill Rd. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects

S. H. Lumb, 31 Oakdene Cres., is the owner and builder of 2 stores and apartments north east corner Danforth and Donlands Ave. Masonry — Wm. Pugh, 1252 Broadview; steel—McGregor & McIntyre Ltd.; electric, painting, plastering, heating and plumbing to be let.

Verdun, Que.

J. O. Hamelin, 140 Lasalle Rd., has the general contract for residence and 3 stores to cost $30,000 on Wellington St., for P. A. Lafleur, 286 Central St. J. E. A. Benoit, 1200 Wellington St., is the architect. Masonry, millwork, roofing, electric, plumbing, heating and plastering to be let.

Vancouver, B. C.

J. A. & C. H. MacDonald, 1571 Main St., have the contract for cut stone for $500,000 apartment being built corner Georgia and Hornby Sts. Architects, McCarter & Nairne, 710 Northwest Bldg.; general contractors, Smith Bros. & Wilson, Ltd., 711 Credit Foncier Bldg.

W. W. Jerrett, 902 Howe St. Vancouver, has the general contract for $10,000 apartment at 3176 Point Grey Rd., for A. C. Jackson, 3175 Point Grey Rd. Architects—Gardiner & Mercer, 827 Birks Bldg. Electric, plumbing, heating, plastering and painting not let.

Power Plants, Electricity and Telephones

Aylwin, Que.

The Hull Electric Co., Hull, Que., are having plans prepared for a concrete dam and power house near the townships of Aylwin, Hincks and Delholin, Que. Engineers are Walter J. Francis & Co., 260 St. James St., Montreal. Concrete dam will be 620 ft. long, 90 ft. wide and 85 ft. high. Power house will be 300 ft. long, 68 ft. wide and 70 ft. high. 6 turbines.

Highland Park, Ont.

The town council of Highland Park (suburb of London) contemplate the extension of electric light and power lines from London. A committee consisting of A. C. Jolley, W. Gardiner and Mr. Whitley have been appointed to take matter up with Sir Adam Beck. Address—A. C. Jolley, Highland Park, London, Ont.

Kamloops, B. C.

The city of Kamloops is having plans prepared for an $8,000 power dam near Kamloops, 10 ft. high x 250 ft. long; earth fill, concrete faced. R. H. Lee is the engineer.

Lachine, Que.

Montreal Light, Heat & Power Co., Montreal, Que., are having plans prepared for a $2,000,000 power house to develop 100,000 horse power. Work will probably go ahead this year.

London, Ont.

Mr. E. V. Buchanan, superintendent, Public Utilities Commission, will shortly call for tenders on approximately $25,000 worth of 13,000 volt underground cable.

Waterford Lake, N. S.

Dominion Coal Co., Glace Bay, contemplate the purchase of a $15,000 turbine to replace the present one.

CONTRACTS AWARDED

Hamilton, Ont.

The foundations are going in for $100,000 sub-station at Ottawa and Beach Rd. for the Hamilton Hydro Electric Commission. Architect—B. H. Prack, 1 Main St.. E.; general contractors—W. H. Yates Construction Co., Ltd., 17 Main St. E.; plumbing—Robt. Fitzimmons Co., Ltd., Hamilton; plastering—Hill Bros., 53 Rosslyn Ave. N.; painting—F. W. Kirk & Son, 205 Charlton West.

Rivieres Des Prairies, Que.

Work has just started on $7,000,000 power development for the Back River Power Co., 35 Common St., Montreal, Que. Preliminary work is being done by Wm. I. Bishop, Ltd., 10 Cathcart St., Montreal. Preliminary plans, T. Pringle & Son, Ltd., 20 St. Nicholas St., Montreal. Tenders will be called by the owners on balance of contracts in about one month.

Weston, Ont.

Bell Telephone Co. of Canada, have awarded the general contract for $40,000 telephone exchange to Wells & Grey, Ltd., Toronto.

Winnipeg, Man.

The following sub-trades have been awarded on $108,630 standby plant for Hydro Electric System: cut stone—Gillis Quarries, Ltd.; millwork—Brown & Rutherford; roofing—Canadian Johns-Manville Co., Ltd. All of Winnipeg. Consulting Architects are James Chisholm & Son; general contractors, John Gunn & Sons.

Miscellaneous

Eastnor Twp., Ont.

A syndicate, care J. H. Cook, Lions Head, Ont., has leased 6,000 acres and plans very shortly to drill for oil, and are interested in prices of equipment, piping, tanks, etc. W. Shaw is in charge.

McGillivray Twp., Ont.

The town council contemplate deepening Aux Sable River. This work will involve a dredge cut of about 7 miles and drainage work. F. W. Farncombe, Dominion Savings Bldg., London Ont., is the engineer in charge. Tenders will not be called until spring.

Point Grey, B. C.

Vancouver Gas Co., Vancouver, B.C., have secured gas franchise in Point Grey and will lay ten miles of mains within the next two years. The cost is estimated at $100,000.

Port Lorne, N. S.

Tenders are being received by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., till October 22 for extension of breakwater 50 x 45 ft. Plans and specifications and Dept. office of district engineer, Bellevue Bldg., Halifax, and post office, Port Lorne.

Ingonish, N. S.

Tenders are being received by Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the reconstruction of breakwater. Plans and specifications at Department, at office of district engineer, Bellevue Bldg., Halifax, and at post office, Ingonish. A 10% accepted cheque required.

St. Francis, N.S.

Tenders are being received till October 22nd, by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., for the construction of breakwater 301 ft. long and 20 ft. wide in St. Francis Harbor, N.S. Plans and specifications

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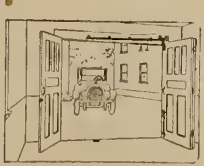

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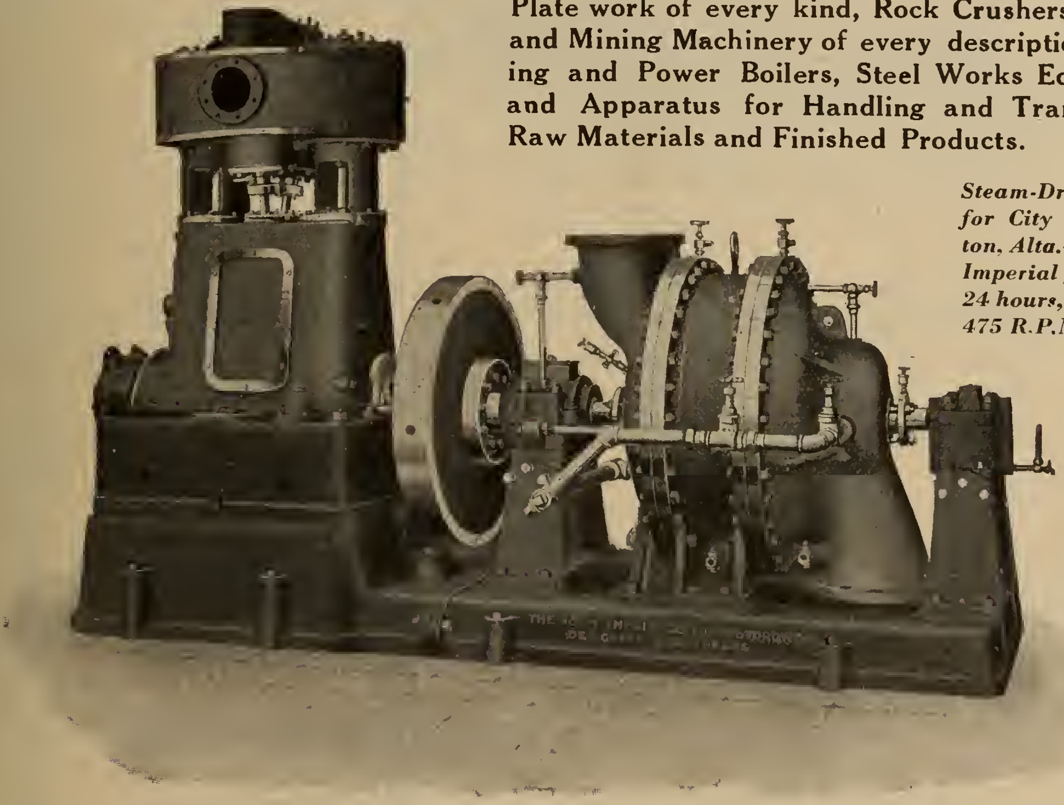

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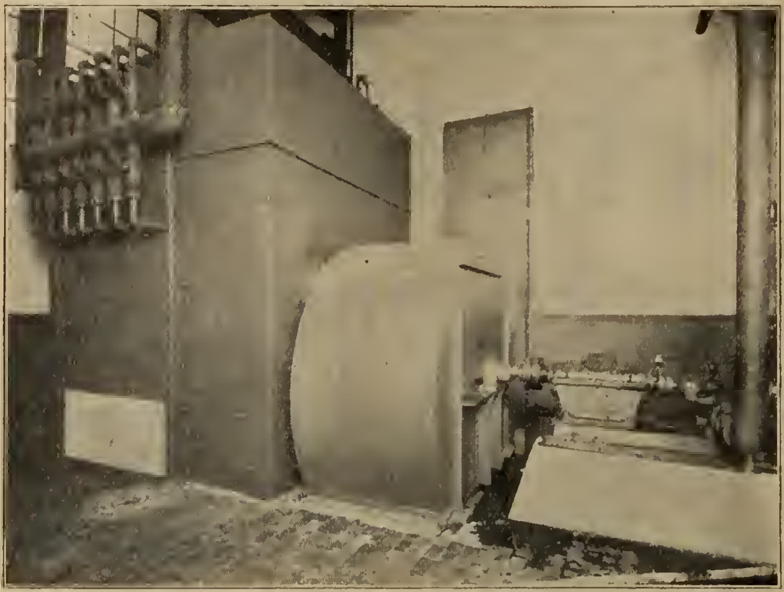

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Montreal Winnipeg Galt Toronto

at Dept. office of district engineer, Bellevue Bldg., Halifax, and post office, St. Francis Harbor.

St. John, N.B.

Tenders will shortly be called by the Dominion Government Dept. of Public Works for Negro Point breakwater extension costing $1,000,000, from present breakwater to Partridge Island. Concrete and steel construction. Resident engineer is Alexander Gray, St. John, N.B.

Tenders are being received by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for dredging required at the deep water berths and C. N. Rly. Long Wharf. Specifications with secretary, office of district engineer, Bellevue Bldg., Halifax, and office of engineer, Old Post Office Bldg., St. John.

CONTRACTS AWARDED

Collingwood, Ont.

The contract for dredging has been awarded to C. S. Boone Dredging & Construction Co., Ltd., Toronto, at $13,800.

Lawlor's Island, N.S.

Canadian Des Moines Steel Co., Ltd., Montreal, Que., have been awarded the contract for steel water tank in Halifax Harbor, to cost $7,980.

London, Ont.

The city of London has awarded the London Concrete Machinery Co. the contract for the supply of an air compressor outfit complete with gasoline engine and suitable receiver mounted on Ford truck and capable of 80 ft. of free air per minute for operating a pavement breaker.

Sandwich, Ont.

Detroit River Construction Co., Sandwich St. W., have the general contract for extension to docks of Pittsburg Coal Co., to cost $100,000.

Tiverton, N.S.

The following have received contracts for $12,300 breakwater extension here: J. K. Thirston, R. W. Durkee and J. E. Thirston, Sandford, N.S.

Toronto, Ont.

The city of Toronto has awarded the contract for a travelling crane to Northern Crane Works, Ltd., Walkerville, Ont., at $8,040.

Three Rivers, Que.

The Wayagamack Pulp & Paper Co., Ltd., have awarded the general contract for $20,000 oil resevoir to Germal & Freres, 87 St. Antoine St. Concrete, steel and piping, 50 ft. dia.

Winnipeg, Man.

The city of Winnipeg has awarded the general contract for travelling crane to John T. Hepburn, Ltd., 18-40 Van Horne St., Toronto, Ont., at $13,919.92.

Fires

Charlottetown, P.E.I.

The woodworking factory of M. P. Hogans, Sons, was recently destroyed by fire with loss of $10,000.

Vancouver, B.C.

The shingle mill of H. L. Brett Shingle Co., Vancouver, was recently destroyed by fire. Loss is estimated at $20,000. The owners will likely rebuild.

BURLINGTON STEEL
COMPANY, LIMITED
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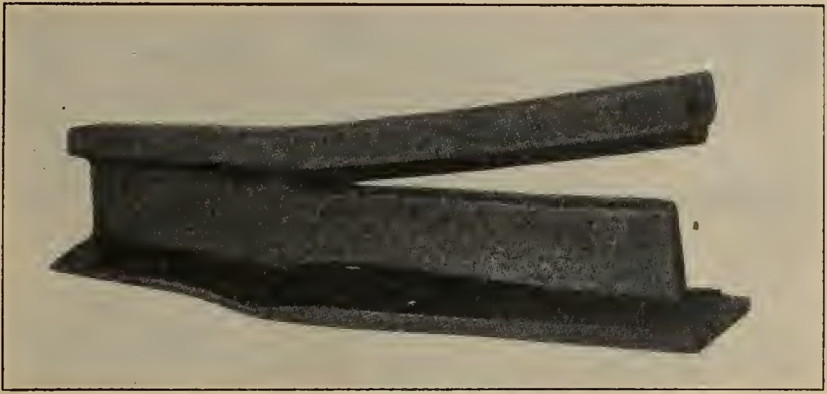


"Close-up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.

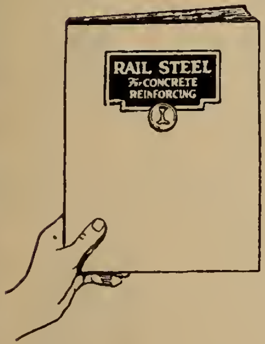
The Re-rolled Argument

Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.
The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M Specification A-16-14, no undesirable re-rolled material can be substituted.



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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1,52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:— Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were advanced recently. New list may be had on application to dealers.
VITRIFIED CLAY PRODUCTS:—Discount on flue linings is 55%

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	14.00	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
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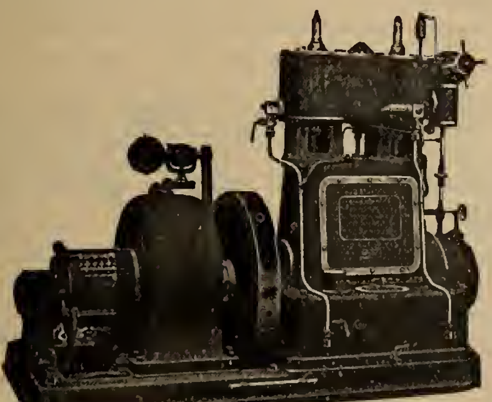

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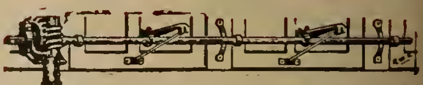

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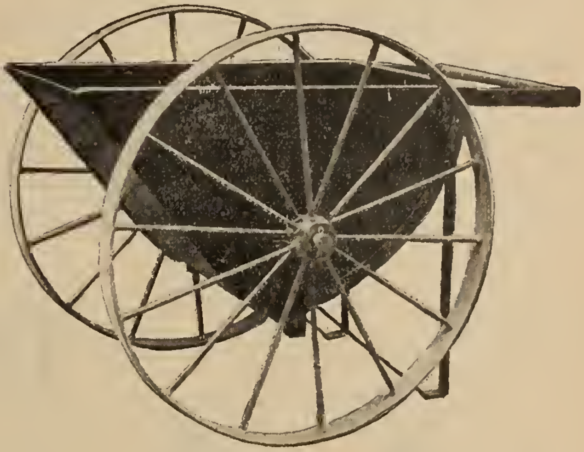

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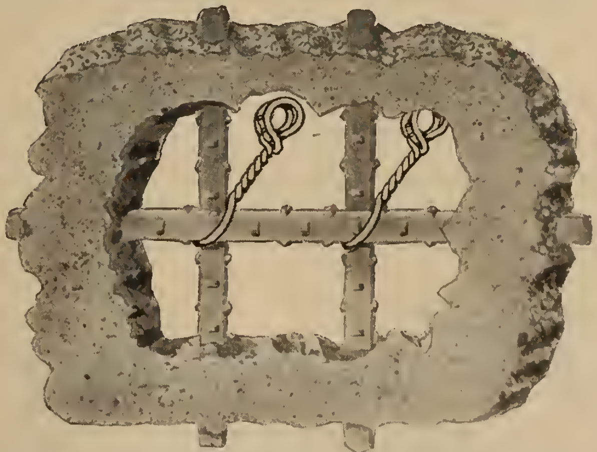

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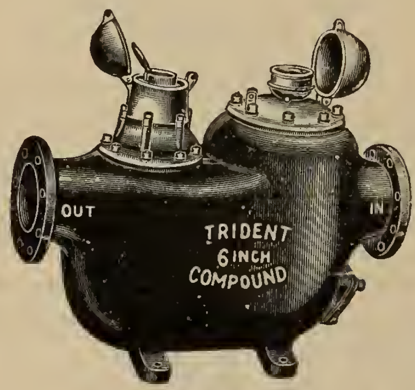

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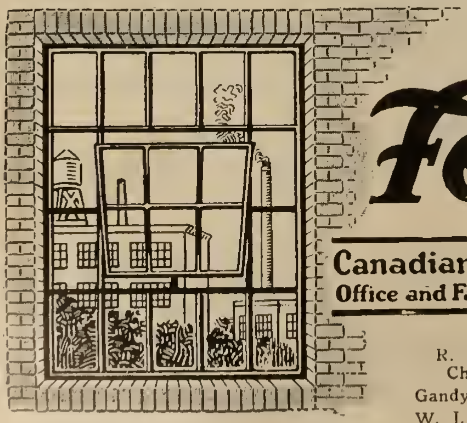

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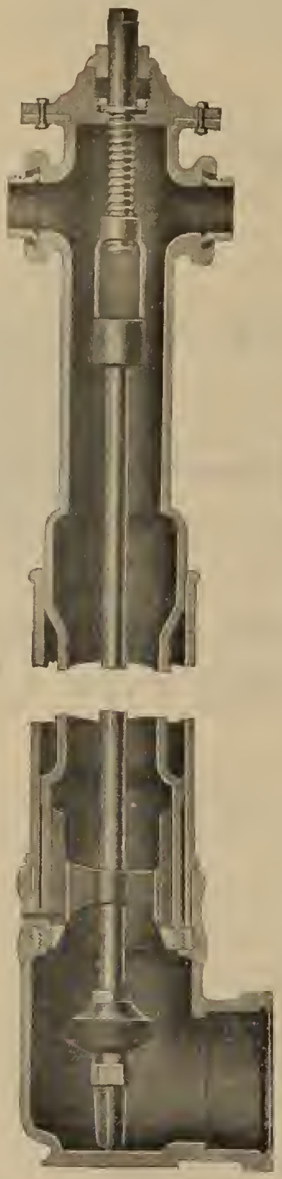

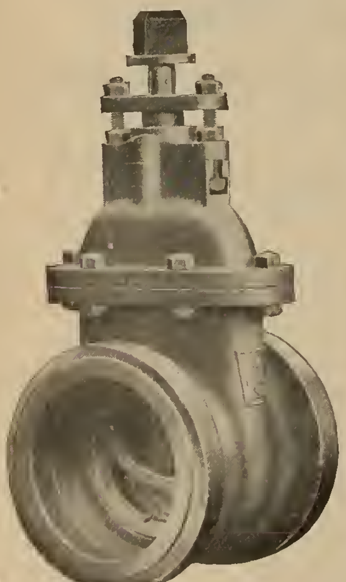

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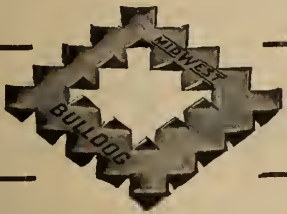

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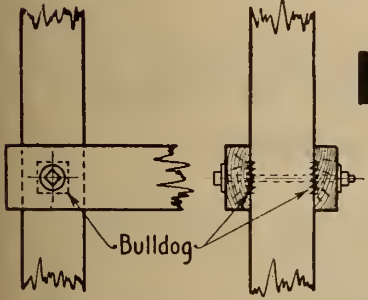

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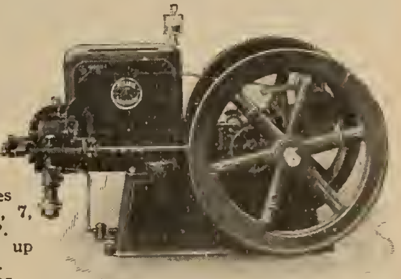

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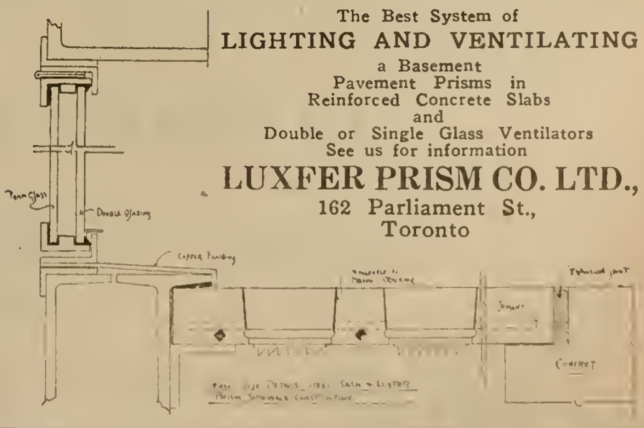
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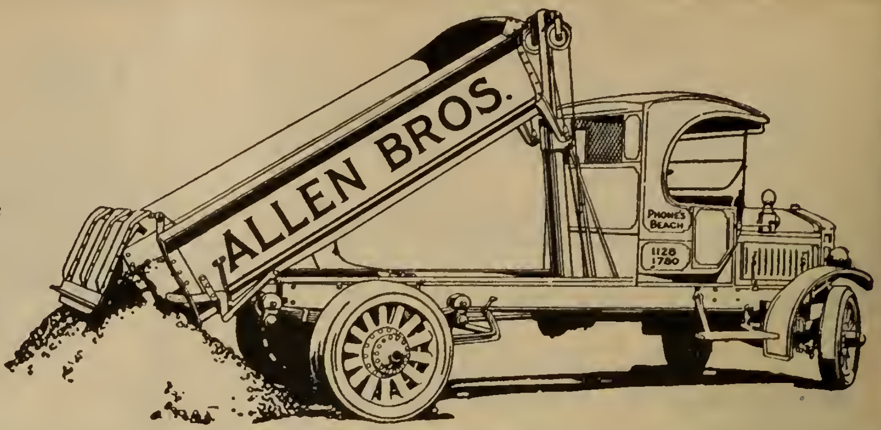

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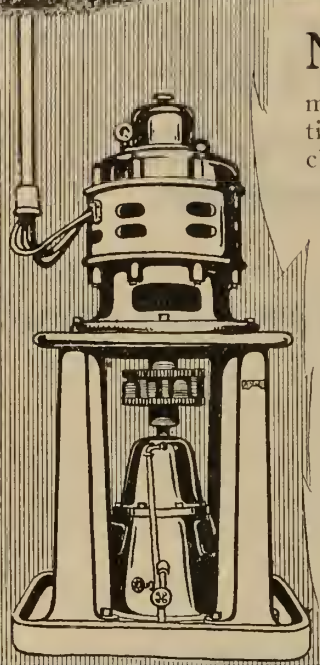
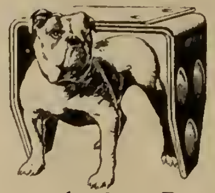


BULL DOG FLOOR CLIP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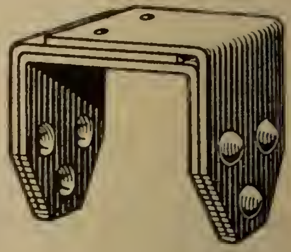

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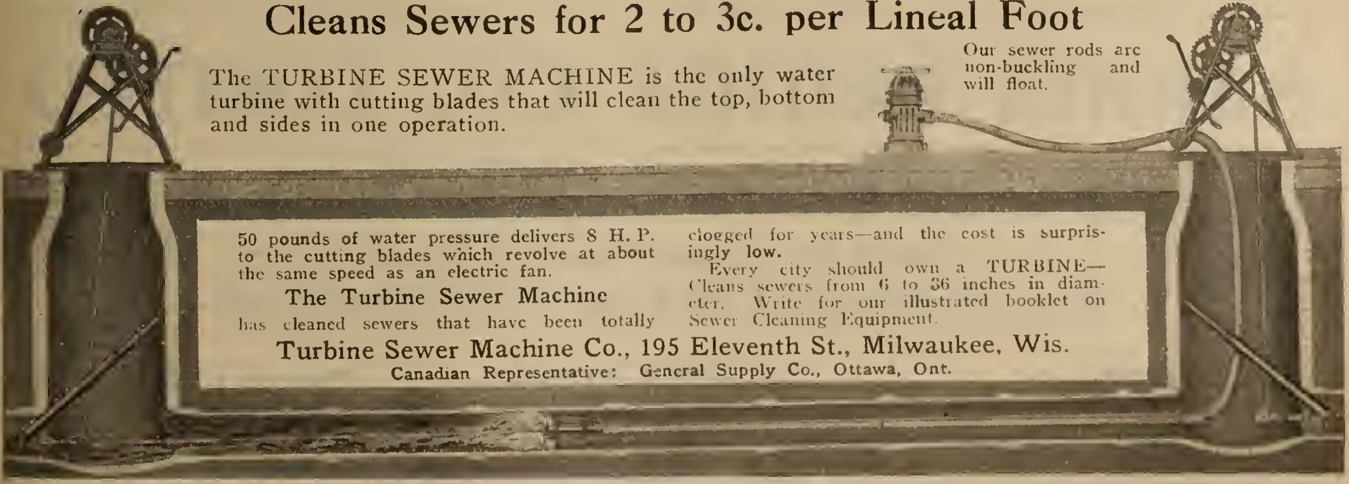

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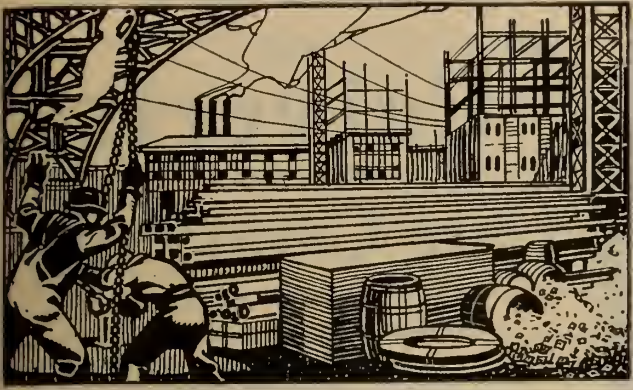

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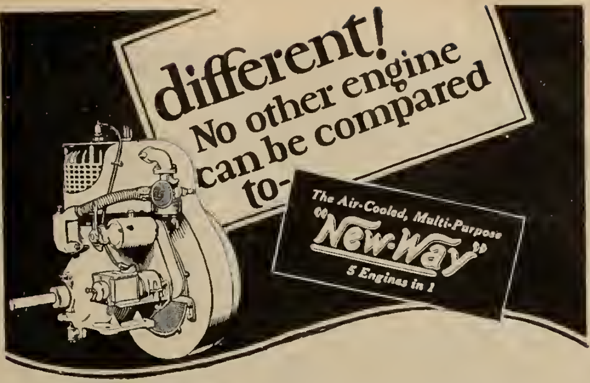

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Made - in - Canada

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Dipped and Wrapped

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Sizes from 3 inches to 10 inches in Diameter

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Will Always Produce Results

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Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
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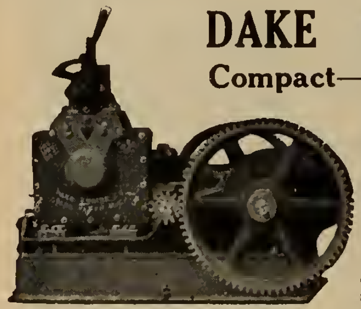

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Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
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Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

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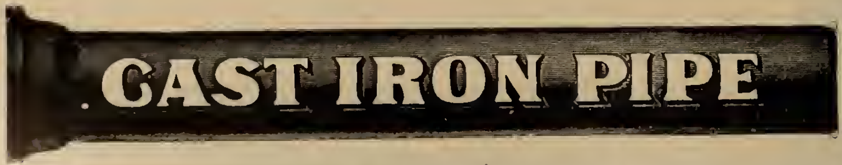

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With a bank of buttons in the car numbered to correspond with the several floors, together with one push button outside of each landing doorway. A momentary pressure on a button starts the car which proceeds to the proper floor where it stops automatically.

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A simpler and less expensive control consisting of two push buttons in the car and two similar buttons at each landing. Pressing the up button starts the car going upwards and it continues to run while the button is pressed, stopping when the button is released. Similarly pressing the down button operates the car downward. The car stops, of course, automatically at the top and bottom landings.

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Flexibility and Strength
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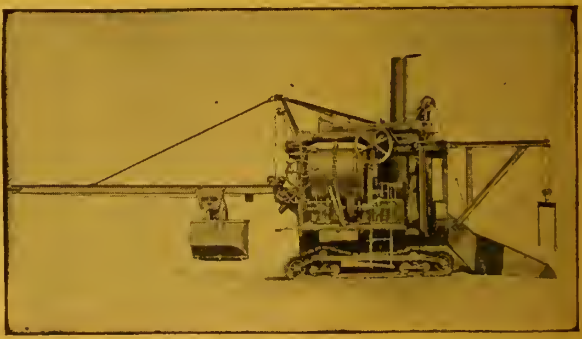

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Vol. 37 Toronto, October 24, 1923 No. 43

Contract Record and Engineering Review

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T. L. PECK CO., LTD. - Plumbing Fixtures
JAMES & McCLUGHAN, LTD. - Plumbing Contractors

Equipped throughout with—

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67 Adelaide St. E.
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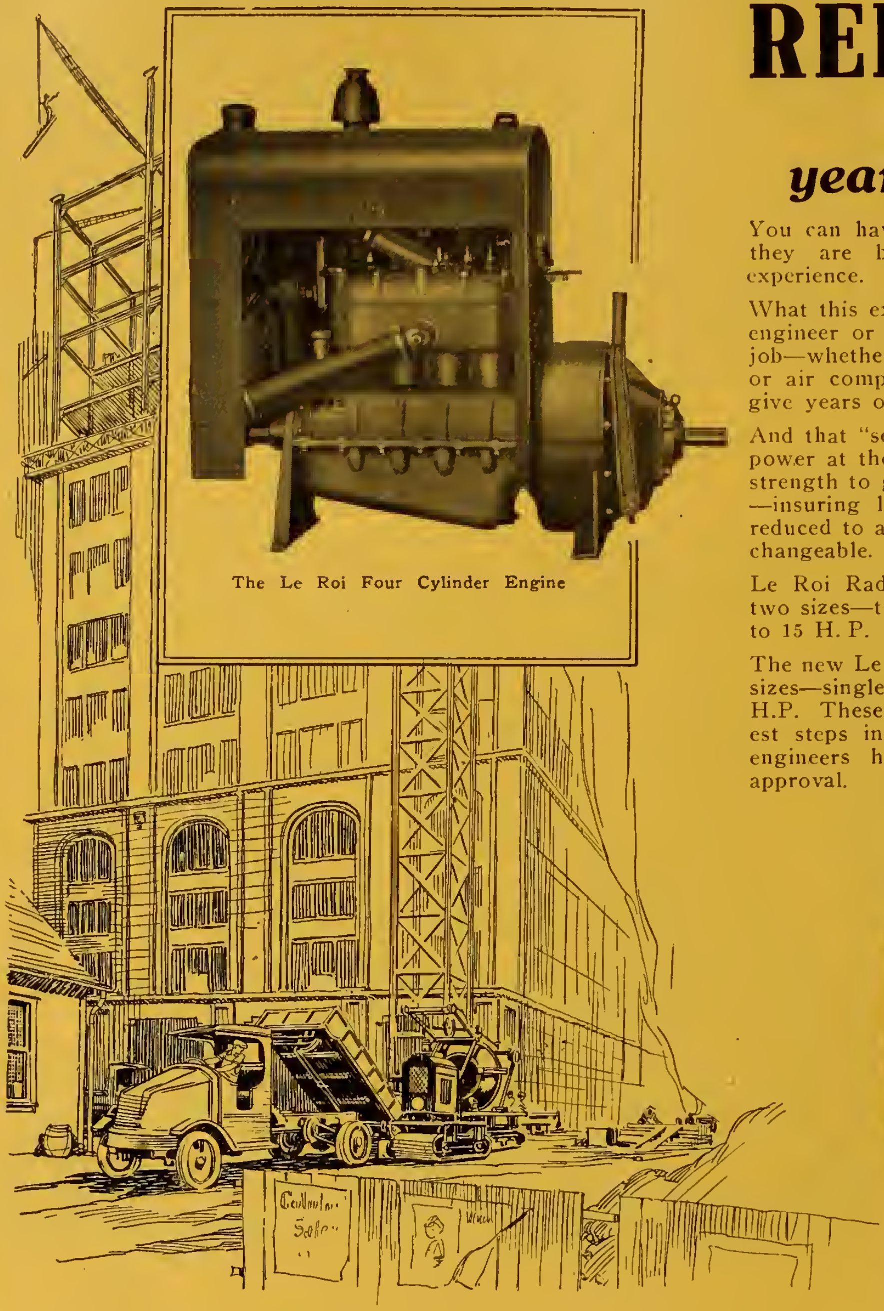

The Le Roi Four Cylinder Engine

RELIABILITY

backed by years of reputation

You can have confidence in Le Roi Engines. For they are backed by years of engine building experience.

What this experience means to you as a contractor, engineer or builder is that your power unit on the job—whether for the concrete mixers, pumps, hoists, or air compressor—is designed and built right, to give years of uninterrupted service.

And that "service" means plenty of steady, unfailing power at the lowest possible operating cost. Extra strength to give extra power is built into every part—insuring long life, and reliability with vibration reduced to a minimum. All wearing parts are interchangeable.

Le Roi Radiator cooled type engines are made in two sizes—two and four cylinder—furnishing from 5 to 15 H. P.

The new Le Roi Hopper cooled type is made in two sizes—single and double cylinder—furnishing 3 to 8 H.P. These engines are considered one of the greatest steps in engine construction. Contractors and engineers have already given them their hearty approval.

If you want to know more about the quality and reputation of these famous engines, let us send you an interesting folder illustrating and describing in detail the various types and sizes.

Le Roi Company
5906 Mitchell Street
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"for dependable power"

Concrete Blocks, Brick and Culvert and Sewer Tile

are staple articles. Thousands of contractors who operate their own plants have found this the most profitable branch of their business. It provides work for their men during winter months and will provide a source of income the year around.

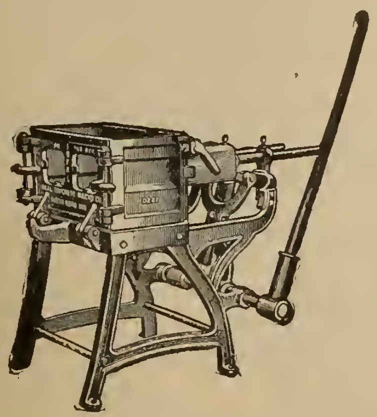


Fig. 910

IDEAL CONCRETE BLOCK MACHINES THE WORLD'S STANDARD

The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.

The Ideal Block Machine makes every style of block required.

—Fully described in Catalogue No. 22-B-1

The Ideal Concrete Block stands supreme the world over. They are made in any size, shape or design to suit the most exacting Architect or Engineer. One of the most recent developments is that of making blocks to receive stucco finish, which is very popular in house construction.

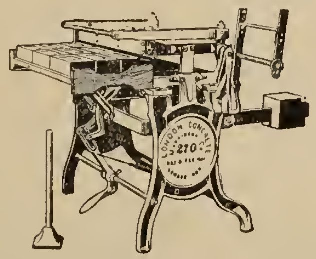


Fig. 91

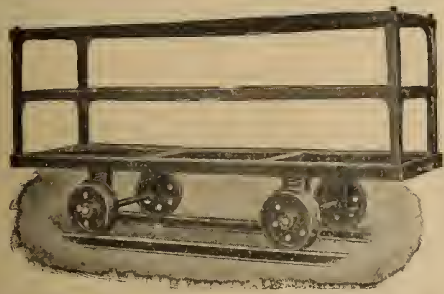
LONDON CEMENT BRICK MACHINE

Hand Power

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression.

This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.



We Make a Full Line of Brick, Block and Tile Cars. Prices on Application

—Fully described in Bulletin No. 17

Cement Brick are in good demand in many localities where building materials are required. They are suitable for all classes of construction and can be profitably made without a large expenditure.

LONDON CULVERT TILE AND SEWER-PIPE MOULDS

Made in all Sizes From 4 in. to 72 in.

Our moulds are made on designs approved by Engineers. There are large profits in making Culvert Tile and Sewer Pipe.

—Described in Bulletin P-1.

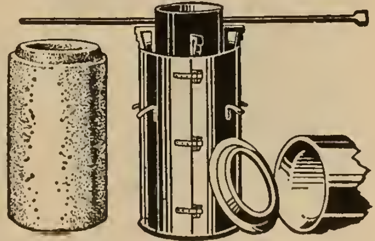


Fig. 95.

London Tile and Sewer Pipe Moulds have been used to make concrete tile for every large Municipal Sewer contract in Canada within recent years. They make tile in all sizes from 4 inches up to 10 feet in diameter.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

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E. A. Muir, Port Arthur, Ont.
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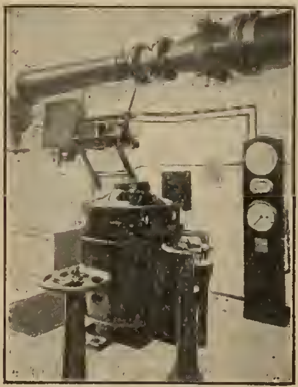
"The entire field of meters and measuring devices for measuring liquids was thoroughly investigated before the VENTURI METER was finally adopted."

The above statement is taken from the paper describing the Milwaukee, Wisconsin, activated sludge disposal plant, by Darvin W. Townsend, Engineer of Designs which was presented before the American Society of Civil Engineers.

End View

The Venturi Meter Tube

In this tremendous sewage-treating plant having a capacity of nearly half a billion gallons per 24-hours are to be used one 48-in. Venturi Meter and twenty-four 24-in Venturi Meters for measuring sewage.



Typical Venturi Sewage Installation

Until 1903 the accurate measurement of sewage flowing through pipe lines was a highly important but unsolved problem which was given much thought by many Municipal Engineers. In that year a 48-inch Venturi Meter was installed in the Ward Street Sewage Pumping Station of the City of Boston. Its success was immediate and still continues. Nineteen-hundred--twenty-three finds hundreds of Venturi Sewage Meters furnishing daily records of sewage disposal plant and pumping station operation. If you have problems of flow measurement, our competent Engineering Department is at your disposal without obligation.

Bulletin No. 137 gives further details.

Builders Iron Foundry

Providence, Rhode Island

Canadian Representatives:
GENERAL SUPPLY COMPANY OF CANADA, LIMITED
Ottawa Montreal Winnipeg Vancouver
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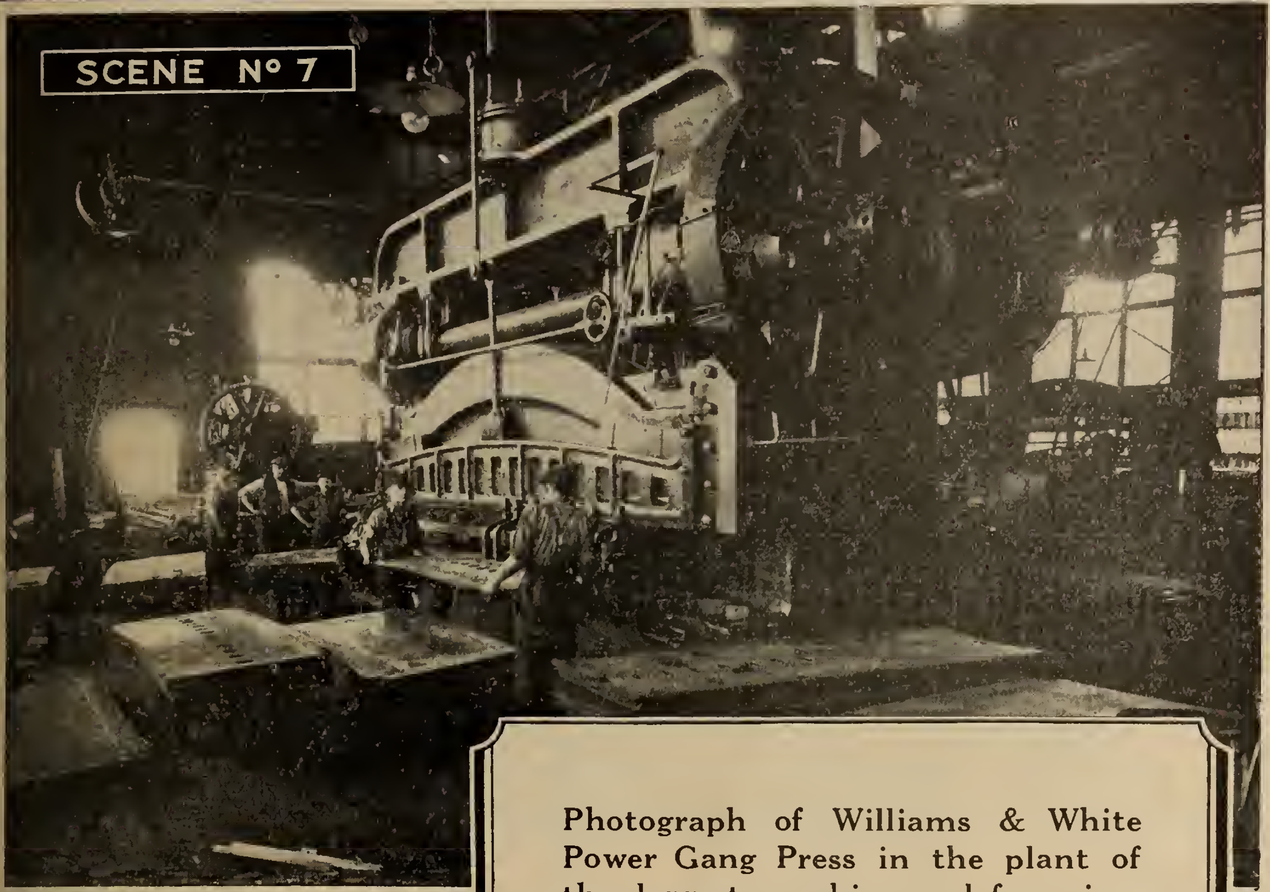
Toronto, Ont.



Photograph of Williams & White Power Gang Press in the plant of the largest machine and farm implement manufacturers in Canada.

Imperial Lubricant used:
Imperial Engine Oil.

IMPERIAL
LUBRICANTS
FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS

Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
Imperial Beaver Cylinder Oil

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Imperial Atlantic Red Oil
Imperial Renown Oil
Imperial Bayonne Engine Oil
Imperial Polar Machine Oil
Imperial Ario Compressor Oil
Imperial Turbine Oils
Imperial Eldorado Castor Machine Oil

FOR VARIOUS INDUSTRIAL USES

Imperial Black Oils
Imperial Cutting Oils
Imperial Tempering Oils
Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.

The care and skill which goes into the manufacture of Imperial Lubricants justifies the confidence with which these specialized oils and greases are used in leading Canadian plants.

The right grade of Imperial Lubricants will meet the lubricating requirements of every type of machinery unit, large or small.

A letter to our nearest branch will bring the advice or services of our expert lubrication engineers.

IMPERIAL OIL LIMITED

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- Air Compressors
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  - MacKinnon Steel Company
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  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Industrial Works
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  - Dominion Wire Rope Co., Ltd.
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  - F. H. Hopkins & Co., Ltd.
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  - Link-Belt Limited
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  - Canadian Equipment Co.
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  - Canadian Mead-Morrison Co.
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  - London Concrete Machry. Co.
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  - Dominion Concrete Company
- Concrete Machinery
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
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  - General Products Co.
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  - Mussens Limited
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  - Canadian Equipment Co.
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  - Buckeye Traction Ditcher Co.
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- Drag Line Excavators
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  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
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  - Canadian Blower & Forge Co.
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  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
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  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co
  - Sturtevant, B. F. & Co.

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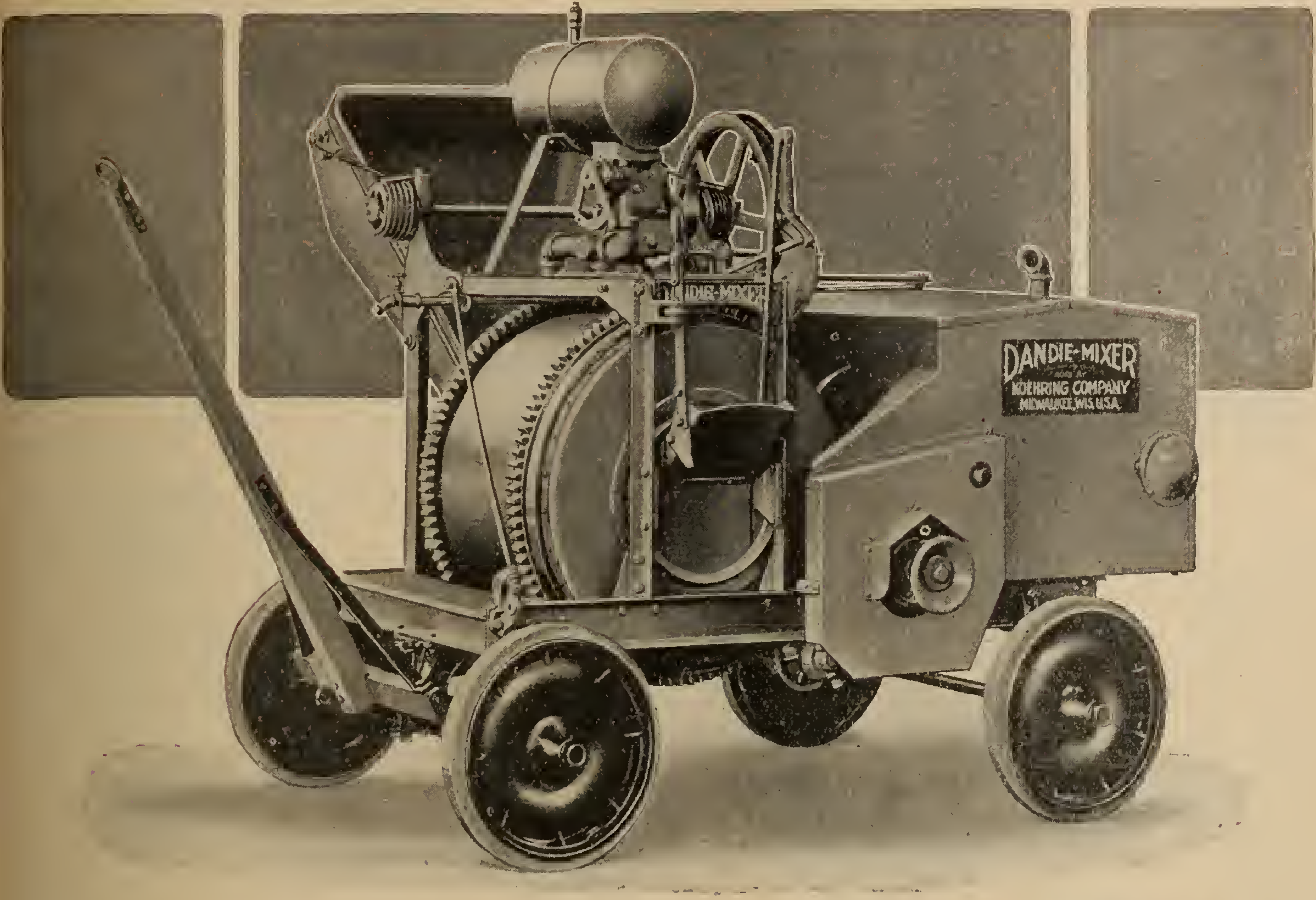


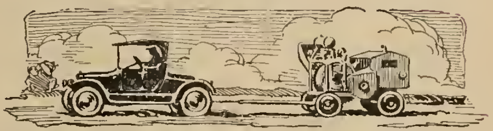
Here's your easiest profit

SAVE time moving from job to job, and use the time for putting concrete in the forms. That's turning overhead into profits.

Hitch the rubber tired Dandie behind your truck and speed from job to job. That means more jobs done per season, and a bigger working field. Where could you find an easier, surer profit?

Neither can you find a surer profit than by investing in the light mixer of utmost reliability—of greatest minute by minute capacity and longest service life.

The Koehring Dandie light mixer is the remarkable value in the light mixer field—built light, but with best Koehring construction—yet selling within the price range for light mixers.

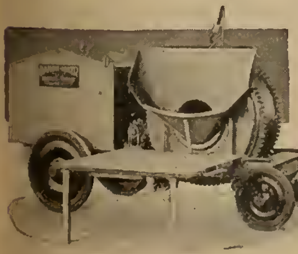


Koehring Dandie Capacities

4 and 7 cubic feet mixed concrete. Steam and Gasoline. Power charging skip or low charging platform—automatic water-measuring tank. Discharge control from both sides. May be equipped with light duty hoist. Mixes mortar as well as uniform concrete.

Learn to judge mixer construction—send today for Koehring Dandie Catalog No.

KOEHRING COMPANY OF CANADA, LIMITED,
105 Front St. East, Toronto, Ont. Phone Main 1498
616 Canada Cement Bldg., Montreal, Que. Phone Uptown 3026
E. N. & W. E. Soper, 63 Sparks St., Ottawa, Ont.



KOEHRING DANDIE
LIGHT MIXER

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Sturtevant, B. F. & Co.

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Koehring Co., of Canada
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Jeffrey Manufacturing Co.
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Pacific Coast Pipe Co.
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Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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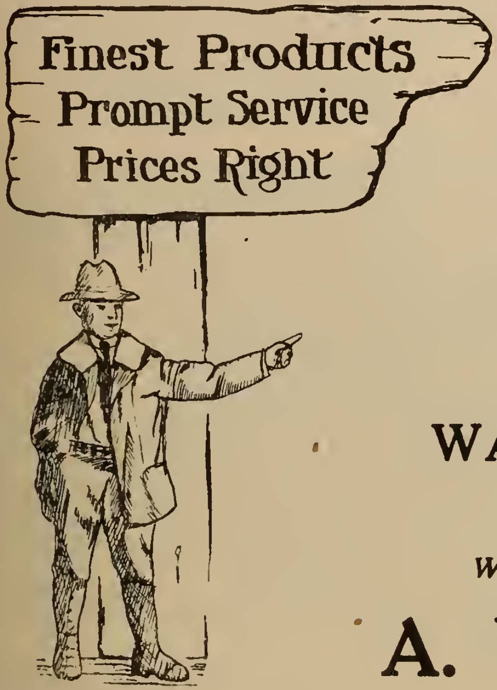
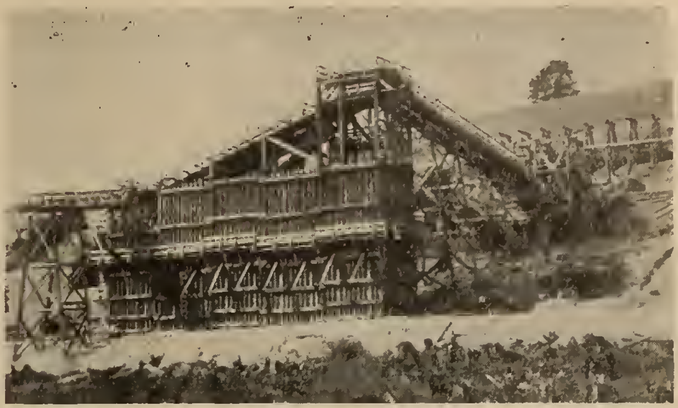




A Part of Our Extensive Plant at Ivanhoe, Ontario

WASHED AND SCREENED SAND AND GRAVEL

We will be pleased to quote on your requirements

A. W. Robertson Limited

ENGINEERS AND CONTRACTORS

Plant: Ivanhoe, Ont. Post Office Telephone & Telegraph: Tweed, Ont.

BATES SYSTEM

OF BAR TYING
for
Reinforced Concrete Work

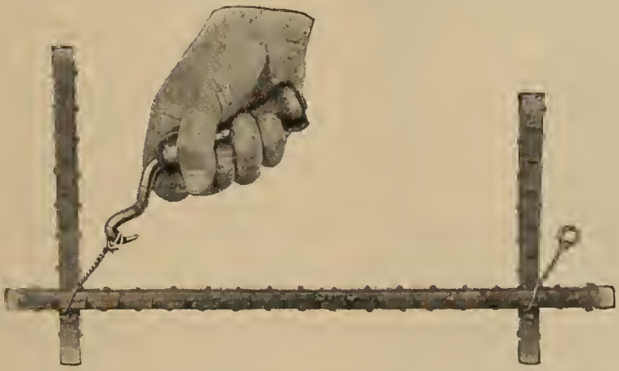
Save 2/3rds the time on concrete reinforcing jobs by using Bates Bar Ties and Tying Tools.

Three turns of the Bates Tool and the Bars are tied.

Write for circular covering prices, etc.

Bates Bar ties were used on the largest reinforced concrete jobs in the United States and Canada.

A large stock of bar ties all sizes carried in stock for immediate shipment.



Tying Concrete Reinforcing Bars with Bates bar ties and tying tool

BATES VALVE BAG CO., LIMITED

Niagara Falls, Ont., Canada

ROBERT G. NOLL
Hamilton Ont., Canada

DRUMMOND & REEVES LTD.
Toronto, Ontario

MUSSENS LIMITED
Montreal, Winnipeg, Vancouver

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London Concrete Machry. Co.

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National Fireproofing Co.

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Wire Rope
Canada Wire & Iron Goods Co.
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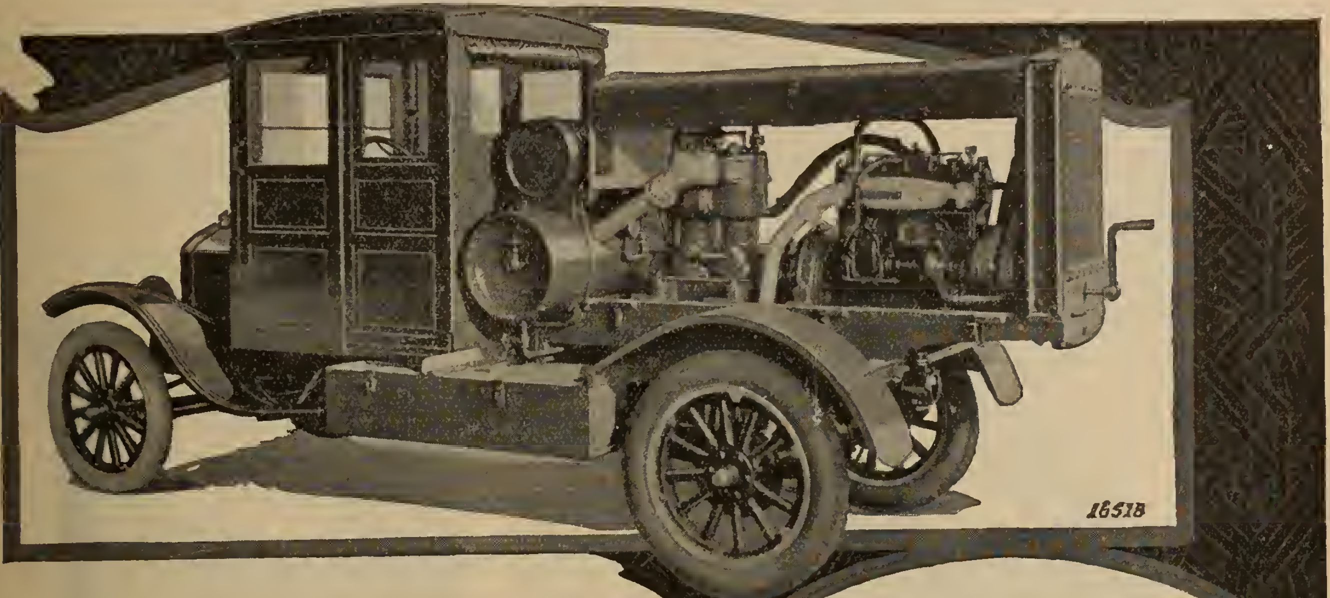
Hopkins, & Co. Ltd., F. H.
Mussens Limited
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company

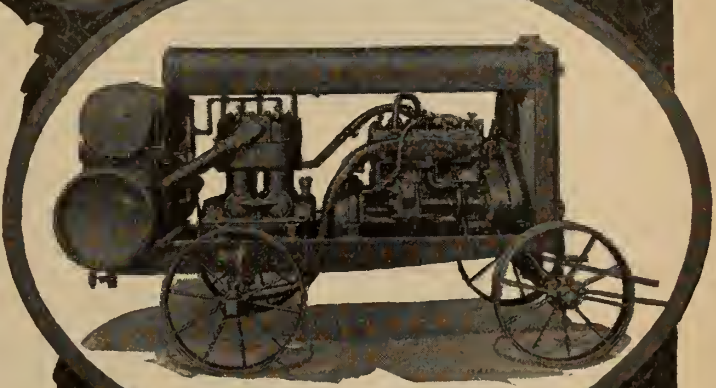
Wood Preservations
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Woodworking Mach'y (Combination
Canadian Blower & Forge Co.

Portable Air Service

MAKE YOUR AIR WHERE YOU USE IT





Reports from contractors, public service companies, municipal and government departments are unanimous regarding the splendid results secured by adding one or more Ingersoll-Rand Portable Compressors to their field equipment.

Where maximum portability and rapid transportation are desirable the 5 x 5" Type 20 Compressor mounted on a standard Ford truck chassis is particularly useful.

This outfit has a capacity of 91 cu. ft. per minute and permits the extensive use of air-operated equipment on work lying over an extended area or on jobs of very short duration even though they are located a considerable distance apart. It is, therefore, widely used by telephone and power companies, structural steel fabricators, gas and water companies, contractors, etc.

You can buy the outfit complete mounted on the truck chassis or ready for mounting on your own truck. Standard outfit includes: compressor; gasoline engine or electric motor, cooling system, air receiver, fuel tank, tool boxes, mud guards and sheet steel covers.

Ingersoll-Rand Portable Compressors are also furnished with steel wheels; on rubber tired wood wheels; on rubber tired trailers or on skids.

We will gladly advise you regarding the type best adapted to your work.

Canadian Ingersoll-Rand Co., Ltd.

Sydney Sherbrooke Montreal Toronto
Winnipeg Nelson Vancouver

For the U. S. refer Ingersoll-Rand Co., 11 Broadway, N. Y.

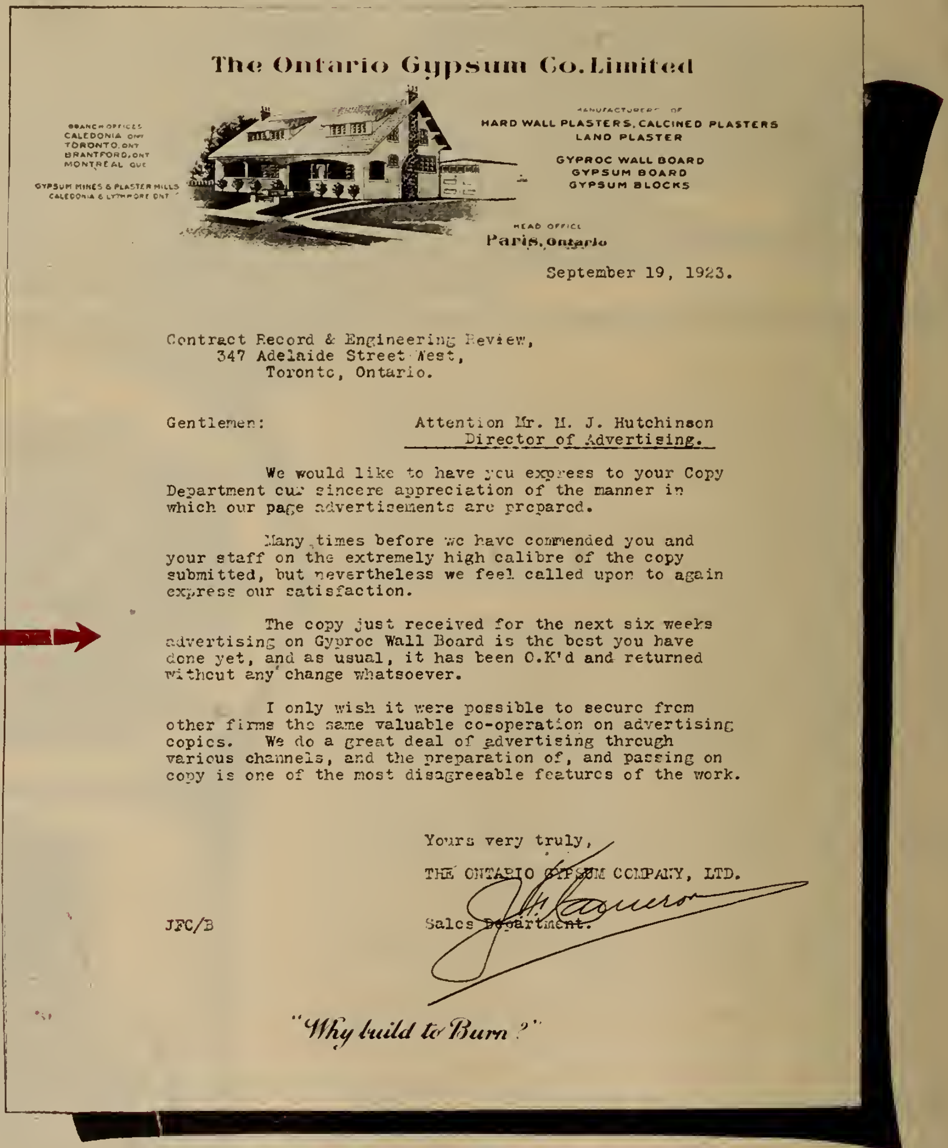
Ingersoll-Rand

Drills Compressors, Oil Engines, Hoists, Pumps

"Valuable Service on Advertising Copy"

The copy service department of Contract Record has been preparing for several years the full page advertisements that have appeared in this paper regularly for The Ontario Gypsum Co., Ltd.

What Mr. Cameron, the Sales Manager thinks of this service is expressed in the letter reproduced below. It has been a pleasure to co-operate with The Ontario Gypsum Company. A good product like Gyproc Wall Board deserves good copy. We are glad to have been able to supply it.



The Ontario Gypsum Co. Limited

BRANCH OFFICES
CALEDONIA ONT
TORONTO, ONT
BRANTFORD, ONT
MONTREAL QUE

GYPSUM MINES & PLASTER MILLS
CALEDONIA & LYTHMORE ONT

MANUFACTURERS OF
HARD WALL PLASTERS, CALCINED PLASTERS
LAND PLASTER

GYPROC WALL BOARD
GYPSUM BOARD
GYPSUM BLOCKS

HEAD OFFICE
Paris, Ontario

September 19, 1923.

Contract Record & Engineering Review,
347 Adelaide Street West,
Toronto, Ontario.

Gentlemen: Attention Mr. H. J. Hutchinson
Director of Advertising.

We would like to have you express to your Copy Department our sincere appreciation of the manner in which our page advertisements are prepared.

Many times before we have commended you and your staff on the extremely high calibre of the copy submitted, but nevertheless we feel called upon to again express our satisfaction.

The copy just received for the next six weeks advertising on Gyproc Wall Board is the best you have done yet, and as usual, it has been O.K'd and returned without any change whatsoever.

I only wish it were possible to secure from other firms the same valuable co-operation on advertising copies. We do a great deal of advertising through various channels, and the preparation of, and passing on copy is one of the most disagreeable features of the work.

Yours very truly,

THE ONTARIO GYPSUM COMPANY, LTD.

J. F. Cameron

JFC/B Sales Department.

"Why build to Burn?"

Copy Service of High Calibre

Good copy for a Good product in a Good publication like CONTRACT RECORD is a combination that makes successful advertising.

We shall be glad to give similar service to other manufacturers.

MUSSENS M LIMITED

1. *Loading snow from windrows, the common practice with Barber-Greene Snow Loaders.*
2. *Showing how the Barber-Greene, in extremely cold weather that would discourage many shovel men, handles snow that is almost entirely ice.*
3. *Showing the Barber-Greene handling large lumps*
4. *Truck loaded by a Barber-Greene—higher than shovelers could throw.*
5. *In Albany a Barber-Greene loaded 45 trucks an hour last winter.*

Here are the reasons in figures why cities are planning their snow battle now

Loading snow with shovel men and trucks:		*Loading snow with Barber-Greenes and trucks:*		*The saving effected by the Barber-Greene*
Loading cost per cu. yd.	$0.186	Loading cost per cu. yd.	$0.045	$0.141
Hauling " " "	.232	Hauling " " "	.158	.074
Overhead " " "	.037	Overhead " " "	.007	.030
Total " " "	$0.455	Total " " "	$0.210	$0.245

THE Barber-Greenes' demonstrated saving is more than 50% of the cost of hauling away snow by hand shoveling methods.

With 5-yard trucks this means a saving of $1.225 per load.

In the removal of at least 12,000 yards of snow, a Barber-Greene can save $2,940. More important is the saving to business and industry, because the swift work of the Barber-Greenes either prevents or shortens the tie-ups due to heavy snow.

The detailed explanation of snow fighting places of various cities is contained in a book "Mechanical Snow Handling" just off the press. We will be glad to send you a copy free.

Ask Our Nearest Office for Particulars

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

You Must Finish the Job—

USE

CARBIC LIGHTS

and prolong the days

CARRIED IN STOCK

Smith Mixers
Marsh Hoists
Insley Chuting

Bucyrus Shovels
Western Cars
and Road Machinery

Complete Line of Machinery and Supplies

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

For Divers Reasons

MORSE DIVING EQUIPMENT

is recognized as Standard

Complete Outfits and Parts
Dresses, Helmets, Pumps, etc.
Carried in Stock

Norton Jacks
Reading Chain Hoists
Union Pile Driving Equipment

Complete Service for:
Contractors, Mines, Quarries, Railroads and Municipalities

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

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Lemoine Academy, Montreal

Concrete For Fire Prevention

Lemoine Academy is a typical example of the Montreal Catholic School Commission's work in safeguarding the lives of pupils and teachers against fire.

For this school, as well as for a number of others recently built, the Commission adopted reinforced concrete with brick facing, a type of construction that not only protects but insures long life and low depreciation costs as well.

Used throughout the building, for dividing walls, floors, ceilings, stairs, etc., concrete gives a thorough measure of protection against fire. It endures the most excessive heat.

Specify
CANADA CEMENT
Uniformly Reliable

CANADA CEMENT
CONCRETE
FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at Montreal Toronto Winnipeg Calgary

The Keystone Excavator operating on a tough grading job in confined space.

There is yet time to clean up on late grading contracts—we can deliver Keystones ex stock

With two months of digging weather still before us this year, there is no reason why you should hesitate to buy a Keystone Excavator. You can speed up your present work and you can put in low, clinching bids on new work which must be done before winter sets in.

The road grading field certainly belongs to the Keystone. With its forward-thrusting 5/8 yard bucket, filling itself in a single shove, you can shift 300 to 500 cubic yards per day with a crew of three men. There's where your profit comes in—quick, clean work with a small crew and low investment cost.

There is another important class of work—ditching and foundation digging—that shows the Keystone up to just as good advantage. Changing the Skimmer Scoop to a Ditcher Scoop and Stick—which then digs toward the Keystone—you can scoop out upwards of 300 cubic yards per day and as the Keystone and teams stay on the ground level, you can work to advantage and profit.

You can buy a new Keystone from us at once. Our built-in-Canada price is mighty attractive.

Let us send you our latest Folder and proposition

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices: Hall Machinery Co., Sherbrooke, Que. and Birks Bldg., Montreal.
Winnipeg Agents: Powell Equipment Company, Limited. Vancouver Agents: M. Grindley Co.

CANADIAN MM Co MEAD-MORRISON CANADIAN MM Co

GRAB BUCKETS

Orange Peel Grab

Wide Opening Scraper Bucket

Buckets in all types and sizes for all purposes—kept in stock

Steam Hoists

Electric Hoists

Derricks

Car Pullers

AGENTS

B.C. Equipment Co.	Vancouver
Ferguson Supply Co.	Calgary
O'Hanlan Ferguson Supply Co., Ltd.	Edmonton
Powell Equipment Co.	Winnipeg
Harvard Turnbull & Co.	Toronto

Made in Canada by

CANADIAN MEAD-MORRISON CO.
LIMITED
CANADA CEMENT BUILDING
MONTREAL
WORKS: WELLAND ONT.

In Stock

STEAM SHOVELS
Revolving and Railroad Type

LOCOMOTIVES
Standard, 36" and 24" Gauge

CARS
Ballast; 20 yard; 6 yard; 4 yard;
3 yard; and 2 yard

DERRICKS, HOISTING ENGINES
AIR COMPRESSORS, RAILS

Eastern Equipment Co.
Limited
MONTREAL, QUE. DORVAL, QUE.
P. O. Box 792

They do it with Clyde!
CLYDE
Standard Two Drum Steam Hoist

"We have five two-drum hoists of your make in use at this time and as fast as our other equipment wears out, we expect to replace it with Clydes. We are very well pleased with the performance of your machines and the service rendered by your company. JOHN FINN & SON, B. L. Bailie, Gen. Mgr."

You will find ECONOMY and DEPENDABILITY built into EVERY UNIT of the CLYDE Line

You'll take pride in your CLYDE!

Clyde Iron Works Sales Company
DULUTH, MINN., U. S. A.
Sole Distributors for Clyde Iron Works

NEW YORK CHICAGO
NEW ORLEANS JACKSONVILLE
SEATTLE MEMPHIS
CINCINNATI PORTLAND

The oscillating fifth wheel

doubles the life of the

AUSTIN

Street Sprinkler

Aside from the many improvements that years of study have incorporated into this tested and approved sprinkler, its exclusive patent oscillating fifth wheel puts it in a class by itself. This device ensures smooth, quiet, balanced action and removes racking strains inevitable in other types.

Write our nearest Branch for complete specifications and prices.

Exclusive Canadian Agents

The Canadian
FAIRBANKS-MORSE CO. LTD.
St. John, Quebec, Montreal, Ottawa, Toronto, Windsor,
Winnipeg, Regina, Calgary, Vancouver, Victoria.

(146)

WILLIAMS GRAB BUCKETS

These buckets are made in Canada by Mead Morrison and combine extreme simplicity with ruggedness of construction. They will stand up under the hardest kind of service.

Information and prices gladly furnished on request.

This Bucket has four part closing purchase

All Types—All Sizes

HARVARD TURNBULL & CO.

RAILWAY, MARINE AND CONTRACTORS SUPPLIES

EXCELSIOR LIFE BLDG., TORONTO ST

TORONTO

Representatives for:
Canadian Mead-Morrison Co. B. J. Coghlin Co. London Concrete Machinery Co.
The Peck Rolling Mills Pulsometer Steam Pump Co.

Figs. 345 and 400 "F. M."

This Jenkins Indicator Post is approved by the Fire Underwriters

Jenkins Indicator Posts are made with the same precision and care as Jenkins Valves and are just as reliable in every respect.

The satisfactory service they furnish is typically Jenkins. Their design, the materials used in their construction and the way they are constructed guarantee that.

These Posts and the complete line of Jenkins Diamond-marked valves are described fully in Catalog No. 9. Write for free copy.

JENKINS BROS. LIMITED

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103 St. Remi St., Montreal

Sales Offices:
TORONTO, VANCOUVER

European Branch, London, W.C. 2 Eng.

Factories:
Montreal, Bridgeport, Elizabeth

Always marked with the "Diamond"

Jenkins Valves

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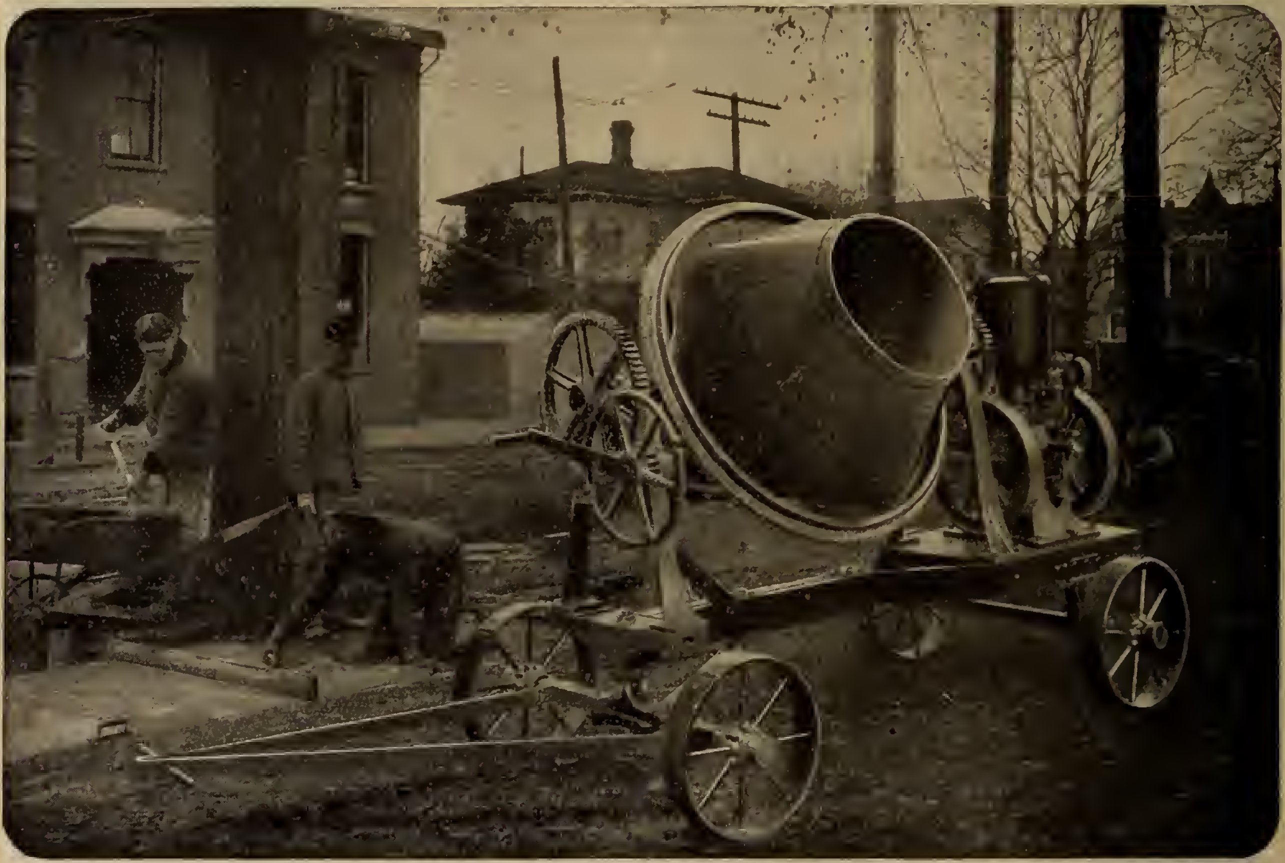

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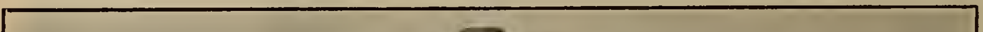

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ESTABLISHED 1886

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The Value of Trade Literature

Contractors often miss a great deal of valuable practical information when they fail to obtain and read the catalogs and other trade literature issued by the manufacturers of contracting machinery and materials. There was once a day when publications of that sort were largely a collection of perverted facts and mis-statements about the equipment or commodity described. Unsubstantiated claims were freely indulged in and, in not unfrequent cases, even deliberate untruths were tolerated if, by that means the sales argument could be intensified. The object, in other words, was to sell the goods not so much on their intrinsic merit—little of which was evident in many of the products advertised through trade literature—as on mere claims or guesses as to their serviceability or performance, many of which, if not most, were entirely incapable of substantiation. Happily, the day in which practice of that sort was common is about over. Merchandising in all lines has taken on a new aspect in which truth in advertising plays a large part, and particularly in the merchandising of contracting machinery and materials, unproven claims of superiority have given way to established records of performance that, because of their basis in fact, carry undoubted weight with prospective customers. The broadcasting of these performance records and service data has become one of the chief functions of trade literature today and because of this contractors are being led to a greater confidence in the various lines of equipment and materials offered for their consideration.

In presenting practical information to their readers these catalogs and bulletins are performing an excellent educative function. By announcing new lines, by indicating how machines may be used or materials applied, by publishing practical experiences, and by recording cost data, trade literature has become an important element in the instruction of engineers, contractors and construction superintendents.

Many concerns spend vast sums of money to produce catalogs and bulletins of attractive appearance and with contents of high order. Just recently one steam shovel manufacturer went to the trouble to record and tabulate costs of shovel operation in a manner that had not been done heretofore, not in an effort to knock his competitors but to present accurate, thoroughly substantiated working information of a very practical kind. When companies will do that, as have many others in a somewhat similar way, it can be said that they are making their trade literature a very useful weapon in the contractors' hands.

We are prone to belittle the efforts of the manufacturers of contracting equipment and materials. Literally millions of dollars have been spent by them in research work in an effort to perfect their products. And they are not doing this with selfish motives. They have, with but mighty few exceptions, the interest of the whole construction industry at heart. Take the concrete mixer manufacturers, for example. Recently they determined that standardization of sizes would be a good thing for the industry—for the contractors as well as themselves—and so they eliminated from their stock products, certain mixers that did not fit in with this standardization scheme. Similarly asphalt producers have reduced the number of grades of asphalt from about 35 to 11. Can it be said, in the face of these and similar facts, that manufacturers are not working in the interests of the construction industry?

Just as the policies of the manufacturers have undergone improvement in this way in recent years, so has their trade literature. No longer do reputable firms produce the slashing, knocking type of catalog that was common enough only a few years ago, but rather do we see literature that is essentially practical in character and thoroughly high class in appearance. Because of that the "Trade Publications" department of the "Contract Record" is an important section of the journal and it is to be hoped that con-

No. 104

Canada's Engineers—K. M. Cameron

An important appointment in the civil service was announced last week by the Civil Service Commission in the promotion of Kenneth M. Cameron, as chief engineer of the public works department in succession to the late Arthur St. Laurent.

Mr. Cameron is moved up from the position of assistant chief engineer and has already assumed his duties. He is a native of western Ontario and received his early education at the Strathroy Collegiate Institute and at London. After matriculating at the University of Toronto, he went to the Royal Military College at Kingston, from which he graduated in June, 1901, with honors, and with the silver medal for general proficiency. In April of the following year, he graduated from McGill University, Montreal, with the degree of B.Sc. in civil engineering. He took up postgraduate work at the same university in hydraulics, was granted the degree of Master of Science, and at the same time was demonstrator in hydraulics and in testing of materials.

From April to December of 1903, Mr. Cameron was in the office of the chief engineer of the C.P.R. and then for two years was office and inspecting engineer of the Canadian Niagara Power Company at Niagara Falls. After a term of lecturing at McGill University on surveying and geodesy, Mr. Cameron went to the United States, where he received some valuable experience. On his return in 1908 he did work for Smith, Kerry and Chace, consulting engineers of Toronto, and also then joined the public works department, first in the offices at London, later at Sherbrooke, and coming to Ottawa in 1912 as senior assistant in the dredging branch of the Department. From September, 1918, up to the present, he has been assistant chief engineer.

Mr. Kenneth M. Cameron

tractors will follow it closely. Remember also that in nearly all cases, manufacturers are willing to forward copies of the literature referred to, on request. It would be a good plan, therefore, for contractors to obtain and study the best of these catalogs and so acquire a vast amount of practical information that cannot but stand them in good stead.

Toronto E. I. C. Program

The Toronto Branch of the Engineering Institute of Canada has planned an interesting series of meetings for the month of November, the following being the program:

Nov. 1.—Joint meeting Toronto section, A.I.E.E., Toronto section, A.S.M.E., Toronto branch of Canadian Institute of Chemistry and the Society of Chemical Industry—Hon. Mr. Justice Wm. Renwick Riddell on "Expert Evidence."

Nov. 8.—M. J. Butler, C.M.G., past president, E.I.C., on "A Proper Freight Rate for Coal," being an attempt to show a method of calculating a fair rate for transporting coal in trainload lots from Alberta to Ontario points with suggestions for a suitable equipment to handle such traffic.

Nov. 15.—Smoker in east common room, Hart House—stunts and good fellowship; Fraser S. Keith, M.E.I.C., will give an address.

Nov. 22.—Herbert J. S. Dennison, patent attorney, on "Patents." As a new patent law has but recently come into effect the lecture will prove instructive.

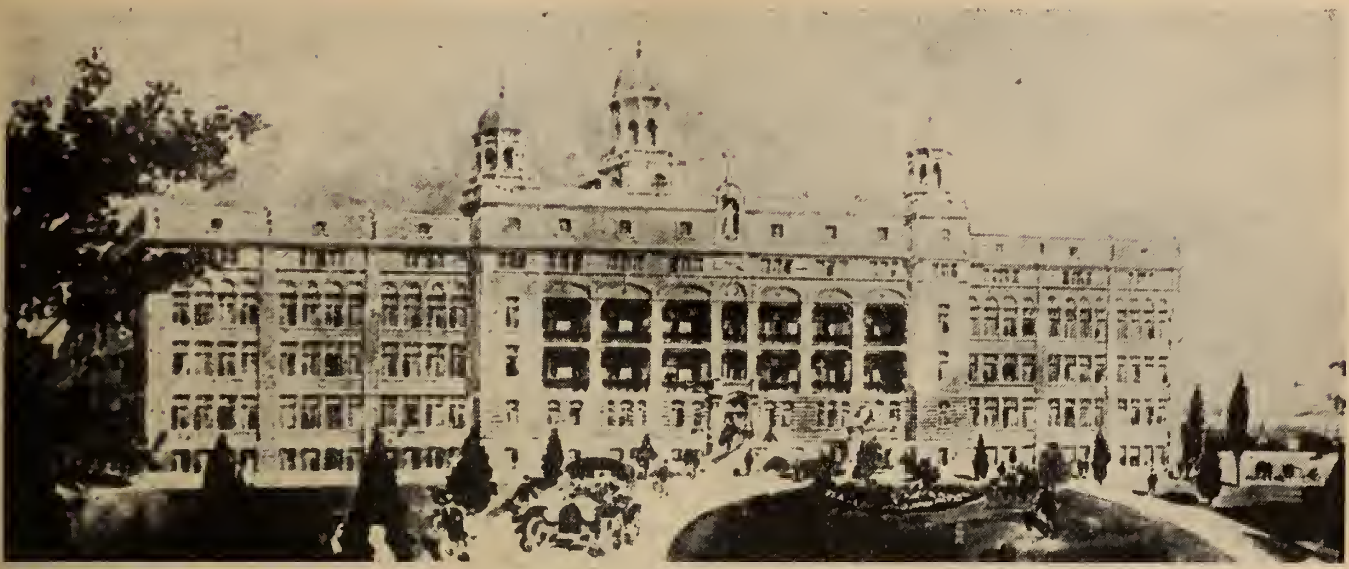
Nov. 29.—S. B. Clement, M.E.I.C., chief engineer, Temiskaming and Northern Ontario Railway on "Recent Development of the T. & N. O. Rly.

Cement Production Breaks Record in U.S.

According to figures of the U. S. Geological Survey production of portland cement in September eclipsed all previous records for any single month. For the first time the 13,000,000 mark was reached, the exact quantity produced being 13,109,000 barrels. Production for the nine months ending September 30 was slightly over 101,000,000 barrels or more than was produced in any full year prior to 1922. Last year's nine months record output was exceeded by about 24%.

Shipments from the mills during September, although less than in August, were greatly in excess of any corresponding month in past years and were about 10% over September 1922. For the first nine months of this year shipments were substantially in excess of 104,000,000 barrels or 18% greater than during the corresponding months of last year.

Unquestionably the cement industry has made a remarkable record this year in taking care of the demands placed upon it. Starting the year with nearly 2 000,000 barrels less in stock than at the beginning of 1922 it has in nine months shipped about 16,000,000 barrels more than during the first nine months of 1922 and yet stocks in manufacturers hands are more than 750,000 barrels greater than on September 30 last year.



The Classical College of Rimouski, P. Q., as it will appear when completed

Large School in Eastern Quebec

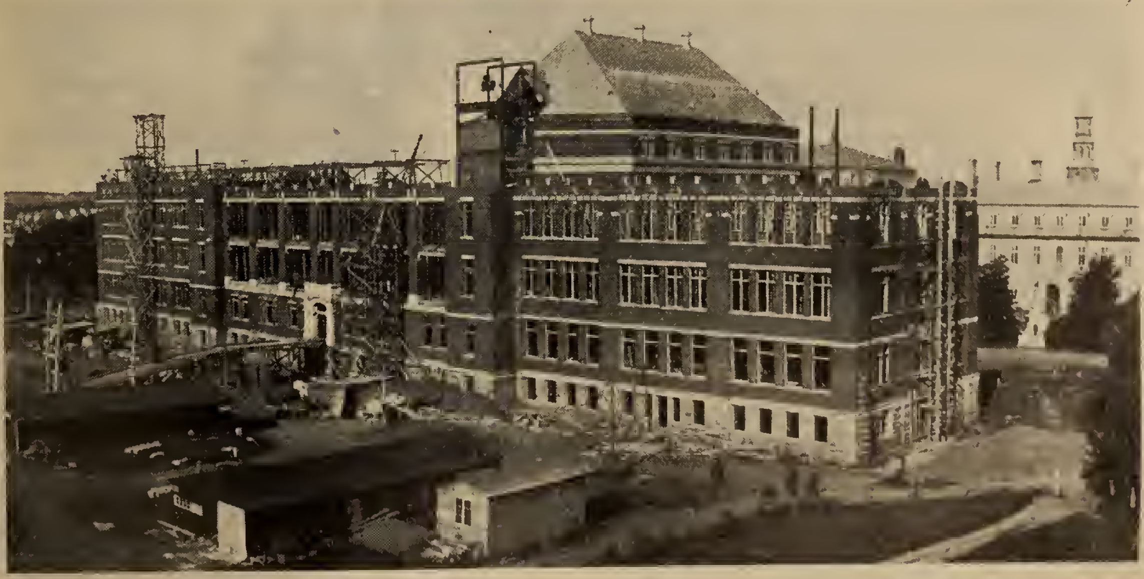
Extension to the Classical College of Rimouski

Completion of Additions Will Make Institution One of the Largest of its Kind in the Country

With the completion of the extensions now in course of erection, to the Classical College of Rimouski, P. Q., this educational institution will be classed among the largest and best equipped of its kind in the country.

The old college, first built in 1863 and which had accommodation for 300 boarding pupils, is an old four-storey Scotch brick building measuring 250 ft. by 50 ft., with a few small out-buildings. To meet the pressing demand for better educational facilities in that part of the province and to keep in line with general educational progress, the directors decided a year ago to undertake extensive enlargements to all branches of the school, which will then have ample accommodation to take care of 600 boarding students.

The following is a brief discription of the improvements which it is expected will be completed by the end of the present school year. The work was started in May 1922 and has been pushed ahead without delay. The new structure will comprise a main body



A progress view of the work under way

measuring 350 ft. by 60 ft., with a wing 160 ft. by 80 ft., the whole absolutely fireproof. The cost will be in the neighborhood of $1,000,000. The new building will be exclusively for the use of the students, the old house being reserved for the use of the teaching staff and for dining and cooking departments. The new additions will contain the most modern school equipment, museums, gymnasium, laboratories, spacious recreation rooms, the library, the chapel and large assembly hall. The style of the exterior of the building lends itself to large windows, which are essential to an institution of this kind.

The foundations are carried down to solid rock. The base of the exterior walls are of random ashlar surmounted with a cut stone water table. All exterior walls are made of Quebec Citadel brick, and are ornamented with white granite from St. Sebastien, Beauce, P. Q., and finished with terra-cotta on the inside.

All floor construction is of reinforced concrete built according to the system advocated by the Trussed Concrete Steel Co.

All interior woodwork will be of hardwood, excepting the sash and doors which will be of white pine. A central hot water system which will supply the heat to all buildings, will comprise a forced circulation by the use of DeLaval steam turbines. There will be an electric system in connection with the boiler house which will provide lighting for the institution. The college will also be equipped with a modern steam laundry.

The chapel which will measure 160 ft. by 80 ft. and 50 feet high from the floor to the ceiling, will be located in the new wing. Above the chapel will be the assembly hall.

It is estimated that 8,333 cubic yards of concrete and 750 tons of steel will enter into the structure, but in this estimate the reinforcing for the floors is not included. Of the accompanying photographs, one shows the progress of the work up to Sept. 15th 1923, together with the old college buildings in the background. The other shows the front elevation of the new completed building.

The plans of the structure were designed by Mr. Pierre Levesque of Quebec City, an architect of long experience in that particular line of work. Mr. J. St. Hilaire of St. Romuald, P. Q., is the superintendent of works under the direction of the architect and Reverend Dr. A. Sirois, former professor of science at the college.

Change in Present Engineering Status

Part Professional and Part Business

Prof. C. R. Young, Speaking on "The Rise of the Engineer," Refers to the Trend Toward Broadening

In accordance with custom, the first evening meeting for the season of the Toronto Branch of the Engineering Institute of Canada was given over to the presentation of the chairman's inaugural address. The subject which was chosen by Prof. C. R. Young, chairman for 1923-4, was "The Rise of the Engineer," a topic that was treated by the speaker in an exceptionally interesting manner. Following the address, the president of the Institute made a few remarks. Attention was also called to the new schedule of fees which a committee of the Toronto branch had drawn up which would be discussed at a later meeting, comparison being made with the schedule recommended by the Quebec Association of Professional Engineers.

Prof. Young's address first traced the development of civilian engineering. At first engineering achievement was scarcely recognized, but as a result of the accomplishments of engineers during the golden age of engineering, from the middle of the eighteenth century to the middle of the nineteenth, the public came to realize the enormous value of the services of technically trained men. It was found that the engineer's forecasts were generally sound and that disregard of his advice was unprofitable and often dangerous. Whereas in former times those who embarked their fortunes on constructional enterprises in the hope of gain were properly called "adventurers," with the rise of the engineer they became "investors." It is rare indeed that a technical enterprise that has the full and unqualified sanction of the engineer is other than profitable.

The speaker paid a warm tribute to the genius of James Brindley, the first of the school of modern engineers, who through the initiation of the first great canals of England quickened and stimulated British commerce. James Watt in a brilliant feat gave to the world his condensing engine which at one stroke cut the consumption of coal for engines down by two-thirds and made possible the application of mechanical power to industry. William Murdoch through his demonstration of the practicability of utilizing gas for light and fuel gave civilization a great asset. Thomas Telford through his tremendous activity in the construction of roads and bridges revolutionized the condition of rural Scotland, and James McAdam did a like service in England. George Stevenson by his ingenious application of the steam engine to the haulage of vehicles brought about consequences of incalculable importance to the human race. The younger Brunel did much to make ocean navigation by steam vessels an accomplished commercial fact. Sir John Fowler through his construction of the first tube railways of London and the demonstration of the possibilities of rapid transit did much to make the modern city possible. Sir Benjamin Baker delivered Egypt from the dread spectre of famine and gave to that country one and a half million acres of fertile land. James B. Eads through his careful scientific observations of the behavior of streams made the Mississippi navigation and virtually created the Port of New Orleans. In Canada, Sir Sandford Fleming, half a century ago, selected the Yellowhead Pass as the most desirable one for the passage of the Rockies by a transcontinental railway, and had not political contingencies interfered, the present barrier to a reduction of freight rates imposed upon the country by the less fortunate location of the C.P.R. through the Kicking Horse Pass would not exist.

Prof. Young, after thus tracing the development of the engineering science referred to the growth of confidence in the engineer and mentioned the influence which the great engineering societies had exerted. He then dwelt on some of the modern problems of the engineer, particularly the relation of the engineer to business undertakings. This part of his address is reprinted below almost in full.

Profession Versus Business

"There is perhaps no question more frequently asked than the time-worn one as to whether engineering is really a profession or not. It has been the ideal of many leading engineers to place engineering on a purely professional basis and to divest it of the characteristics of a business which it has taken on in recent years. One must frankly admit that the results achieved have not been gratifying and that engineering is, if anything, farther from the status of a pure profession than it was a generation ago.

"If one were asked to define the essentials of a profession, one might say that properly the professional man should make his services available to such clients as care to consult him, and generally for stipulated fees rather than for a salary. Relations with the client should be on the highest possible ethical basis and no measures should be adopted for the securing of commissions which would not be acceptable in type in the professions of law and medicine. One might enumerate as some specific essentials of an engineering profession, the possession of skill and learning by the practitioner, the maintenance of high ethical relations with the client, and the observance of altruistic motives in his relations with the public.

Prof. C. R. Young, chairman of the Toronto branch, E. I. C., whose inaugural address is summarized in this article

"So basic is the idea of learning in a true profession that one often hears mention of the "learned professions." It is inadmissible for the engineering practitioner to be an ignorant or unlettered man. Although the proprietor of a barber shop or of a shoe shining stand may be operating for the benefit of such customers as may care to patronize him, and for a fixed fee, it cannot be maintained that these callings are in the category of professions, in spite of the recent effort to incorporate barbering in British Columbia as a skilled profession. But on the basis of learning as a requisite, however, one might very properly include in the ranks of the "learned professions," the work of the skilled accountant or auditor, who in his field maintains towards clients relations that are comparable with those maintained by the professional engineer.

"A basic essential of professional life is that the relations of the professional man to his clients should be those of the most exalted trust and of the most circumspect solicitude for the interests of his employer. Telford, for example, while acting as an engineer for several canal companies declined the appointment as engineer to the Liverpool and Manchester Railway on the ground that it would prejudicially effect the interests of his existing employers. Sir John Fowler was pre-eminently a shareholder's engineer. He restrained his natural impulse to create great and enduring works for monumental purposes and made sure that the interests of the persons who were furnishing the money were primarily observed. The public very properly expects of a professional man a high attitude with regard to public obligations. It expects him not only to further the interests of the people at large, but to prepare himself for the better performance of such service. The appropriate attitude to his profession might very well be put in the words of Francis Bacon: 'I hold every man a debtor to his profession; from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavor themselves by way of amends to be a help and ornament thereto.'

"Smeaton's attitude in this regard would have fully satisfied Bacon. He held that 'the abilities of the individual were a debt due to the common stock of public well-being.' Having this in mind, he limited his professional employment so that he might devote a certain portion of his time to self-improvement and scientific investigation. He systematically resisted tempting offers to attract him from his settled course.

Combination of Profession and Business

"One must admit that the present status of engineering is that of part profession and part business. The methods of solicitation of new work in engineering are by no means in conformity with those observed by the leaders in the professions of law and medicine. Intensive canvassing and lobbying which characterize the conduct of some engineers in the consulting field at the present time do not well comport with the high ethics of Smeaton and Telford. They are of one and the same type as the methods employed to secure orders for bacon or boots.

"The competition that is sometimes introduced by engineers with others who have to all intents and purposes secured a given piece of work is not that characteristic of a pure profession. Thus, when the plans of an engineer have been accepted and tenders are called thereupon, it may be questioned as to whether alternative designs are properly tolerable without the full prior knowledge and consent of the client's engineer. It is, of course, a common procedure for engineering contractors to submit their own designs in competition with those of the engineer in charge of the work, and the practice is so firmly established that it is not likely to be given up. In essence, it is an embarrassing procedure. It in effect proclaims that the client's engineer has insufficiently studied the situation and that he has overlooked the merits of another scheme which might prove cheaper than the one which he recommended. Anything which lessens the confidence of the client in his engineer's complete mastery of the subject may well be considered as questionable ethically, but so far have we proceeded from pure ethics in the practice of engineering that this procedure often excites no comment. Under such conditions it becomes very difficult to frame a comprehensive code of ethics for engineers. When they are operating in part as professional men and in part as men of business it does not seem practicable to establish a purely professional code of ethics that will procure uniform observance by the engineers of the country.

Future of Engineering

"We are, therefore, constrained to ask whence is the engineer bound and what is the future of engineering? One may find in the public statements of leaders of the profession for many years back expressions of doubt as to whether society could absorb all the engineers who were offering their services. Thus, James Walker, one of the early presidents of the Institution of Civil Engineers said in his presidential address of 1841, as follows:—'While I congratulate the Institution on the increase in its members, I ought at the time to express my opinion that, from the number of young gentlemen who within the last ten years have studied for, or have entered, the profession, the supply is likely to be at the least equal to the demand, and to caution those who intend entering, or are now studying for it, against confining themselves to the strictly professional part of the usual routine of education. The railways, both during the preliminary surveys and in their subsequent construction and management, in addition to other works of engineering, have given employment to many. But the principal towns are already connected by railways, or engineers and surveyors are now employed in projecting or executing lines where they are yet wanted. Is then the demand for professional gentlemen likely to increase? Is it not likely rather to decrease?'

"At that time the total membership of the Institution was 475.

"There had arisen in the early days of railways in England a phenomenal demand for the services of men with any experience in engineering or surveying. Surveyors and levellers were paid as much as from six to fifteen guineas a day, although many were highly incompetent and had secured what knowledge they knew of the subject from very brief courses of instruction. It is recounted that a peddler of stationery earned five guineas a day and his expenses as an assistant surveyor. A fat wheezy fellow, long unaccustomed to work, received three guineas a day for work on surveys, and could have had five had he been willing to attempt the hills in a bold piece of country. He preferred three and a level line.

"The questions that were raised in the days of James Walker with respect to the absorptive power of Great Britain for engineer's might well be raised in Canada at the present moment. There are in this country approximately 12,000 engineers in all grades and departments. At the same time there are in attendance in Canadian engineering colleges about 2,100 students, or about one-sixth as many as all the engineers in the country. One may well ask if employment on strictly engineering work is to be found for such a large output. In the United States the situation is still more striking, for although the population of that country is only about fourteen times greater than that of Canada, there are about 50,000 engineering students in the engineering colleges.

Administrative Opportunities

"Change in the character of employment will constitute the solution of the problem. Whereas fifteen or twenty years ago, construction of railways at a terrific rate offered employment for large numbers of young engineers, that source has largely dried up and railway employment has to do principally with maintenance and operation. Any group of engineers relying wholly on original construction for employment may be embarrassed during periods of hard times. With a commercial depression, the first thing that is done is to curtail construction and extensions. If, however, the engineer is trained and experienced in problems of operation and management, he may easily pass into executive and administrative position with perhaps financial advantage to himself. One interesting source of employment of this character now opening up is city managerships. There are in America over three hundred cities and towns governed in this manner and of the managers in charge a substantial portion are trained engineers.

"So frequent have been the instances of graduate engineers undertaking work involving a combination of engineering and business that engineering colleges in America have for some years past been undertaking to prepare men for this combined field. Harvard University offers a five-year course in business administration and engineering combined, options being granted in accordance with the department of engineering elected by the student. Yale offers a four-year course in administrative engineering devised for students who expect to fill executive positions in which a knowledge of engineering is required equivalent to that ordinarily gained in any one of the regular courses. The University of Kansas offers a course in engineering and administrative science with two technical options. Pennsylvania State College has regular graduating courses in industrial engineering. New York University has established a four-year course in business and engineering. The University of North Dakota has a four-year course in general industrial engineering with sixty per cent of the time devoted to fundamental subjects in science, mathematics and technical engineering and forty per cent to subjects pertaining to business management, administration and allied topics. Union College offers a combined four year course in which business and cultural subjects form thirty-five per cent of the total. The universities of Illinois, Wisconsin, Ohio and Cincinnati maintain co-operative courses in which engineering is combined with economics in the schools of commerce.

"Thus, there is undoubtedly a strong trend towards the broadening of employment of the engineer. If it be conceded that a departure from strictly technical lines is legitimate, an immense new field of activity opens out for the young man with a combined training. Experience is showing that a larger and larger proportion of engineering graduates are taking positions in which a combination of business and technology is desirable, and without doubt the time is coming when the technically trained man will make his influence as strongly felt in business as in the specialized fields of engineering enterprise."

Practical Uses for Power Scrapers

May be Employed Efficiently and Economically for a Variety of Purposes—Some Specific Applications, Illustrated with Diagrams of Typical Layouts

Power scrapers are among the most versatile pieces of equipment that a contractor may use. They are capable of use for a large variety of purposes under various conditions and have proven exceptionally economical and efficient. A number of types of scrapers are manufactured to suit the class of work for which they are intended, but whatever the type their operation is a simple matter.

A wire rope is attached to the front bridle of the scraper bucket. This cable, called the load line, extends across the dumping point to a guide sheave and thence to the front drum of the two-drum hoist or power unit. Another cable is attached to the back of the scraper and extends to the back of the excavation to a tail block, and thence to the rear drum of the hoist over necessary guide sheaves.

If the empty scraper is at the digging point, the operator engages the front drum which winds up the load line and drags the scraper forward, at the same time overhauling the pull back line from the rear drum. This causes the scraper to dig until filled. Then the bucket stops digging because it rides on the load. When the loaded scraper reaches the dumping point, the friction of the front drum is disengaged, stopping the scraper. The rear drum friction is then engaged, winding up the pull back cable and pulling the scraper away from the load and back toward the digging point. When the digging point is again reached the engagement of the friction is reversed and the cycle repeated at the will of the operator.

Operating Range

Material can be dug, conveyed considerable distances, and automatically dumped without introducing any other labor or any intermediate handling equipment. More important still, this long line of operation can be shifted over a wide area without delay or difficulty, simply by changing the location of the guide blocks. Digging and dumping point can both be controlled with the required accuracy. And a power scraper operates on hill-side, mushy ground, submerged flats with as much facility as when on nice level ground.

Some particular applications of the power scraper are indicated in the following paragraphs.

Loading Direct to Cars and Trucks

In pit-run gravel operations and reloading from stock-piles, material can be handled into cars or trucks in one operation, at low cost, by using a power drag scraper and incline.

The incline is of timber, preferably with rails to protect the planking and a trap is built at the head of the incline through which the material dragged up by the scraper falls into the car or truck. If boulders have to be removed, a grizzly is placed over the trap. The guide blocks are elevated by an A-frame at the head of the incline. When the hoist can not be set high enough to insure full view of the work by the operator, the levers can be mounted in quadrant on a platform at the top of the incline. The arrangement may be made quite portable by placing the incline on skids and using a hoist with road mountings.

Small and Medium Gravel Pit Operations

Hundreds of small gravel plants have increased their outputs and reduced operating expenses in recent years by installing power drag scrapers in place of team scrapers, wagon loaders, portable conveyors and various excavating and loading contrivances. An inexpensive scraper, especially a portable outfit, becomes a big money-maker in the hands of an ambitious owner of a small gravel deposit.

For getting the most income from a larger gravel bank, the popular combination of a medium-sized washing and screening plant with a capacity of 400 to 600 tons per day and a ¾ cu. yd. or 1 cu. yd. scraper. The low cost of production attained with such an installation is astonishing.

At Large Sand and Gravel Plants

Many commercial sand and gravel plants with

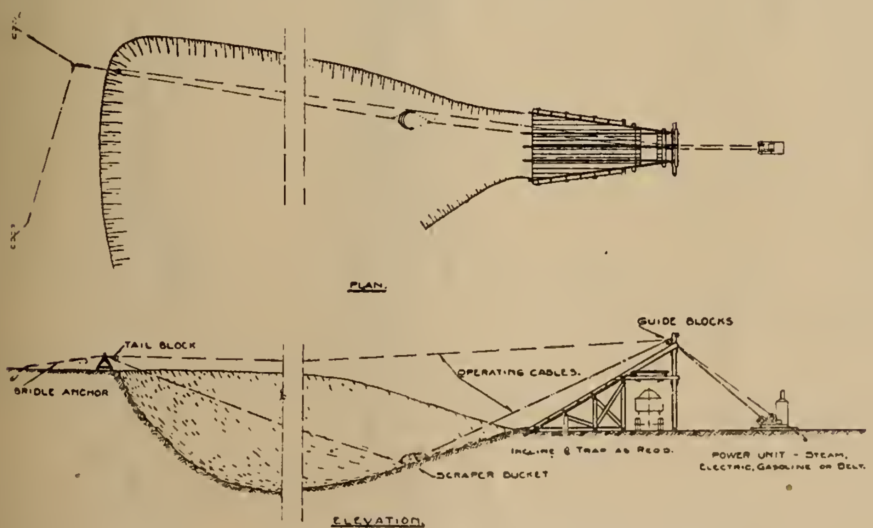


Fig 1—Typical power scraper installation loading direct through trap

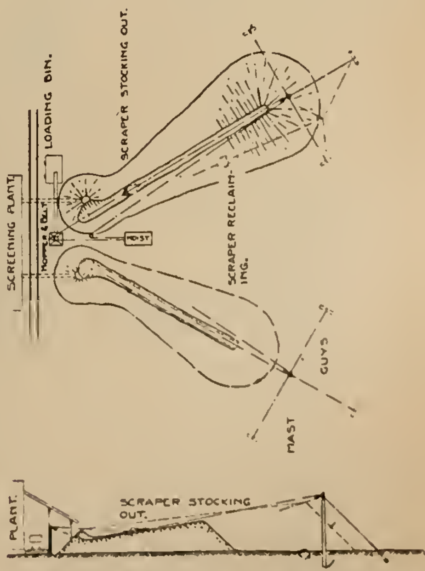


Fig. 2—Installation for storing and reclaiming two sizes of gravel

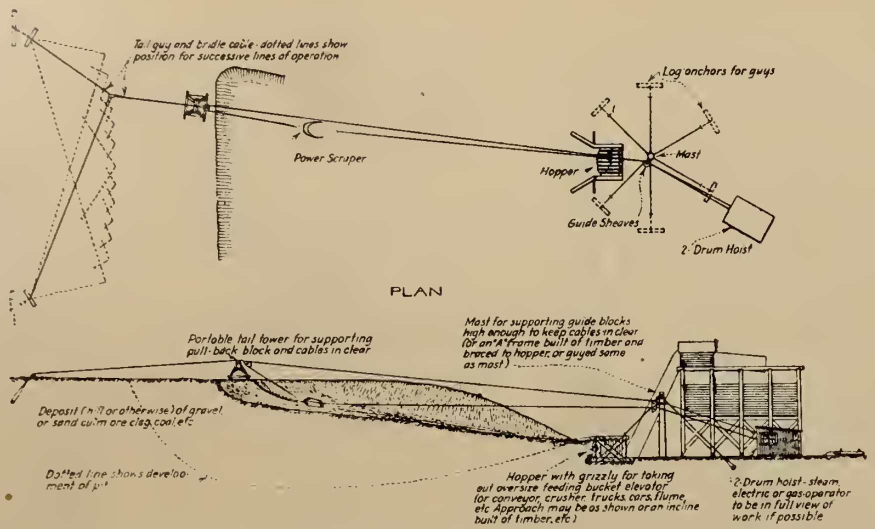

Tail guy and bridle cable - dotted lines show position for successive lines of operation
Log anchors for guys
Power Scraper
Mast
Hopper
Guide Sheaves
2-Drum Hoist
PLAN
Portable tail tower for supporting pull-back block and cables in clear
Mast for supporting guide blocks high enough to keep cables in clear (or an "A" frame built of timber and braced to hopper, or guyed same as mast)
Deposit (hill or otherwise) of gravel, or sand culm ore clay, coal, etc.
Dotted line shows development of pit
Hopper with grizzly for taking out oversize feeding bucket elevator for conveyor, crusher, trucks, cars, flume, etc. Approach may be as shown or an incline built of timber, etc.)
2-Drum hoist - steam, electric or gas-operator to be in full view of work if possible

Fig. 3—Typical power scraper installation for medium sized sand and gravel plants

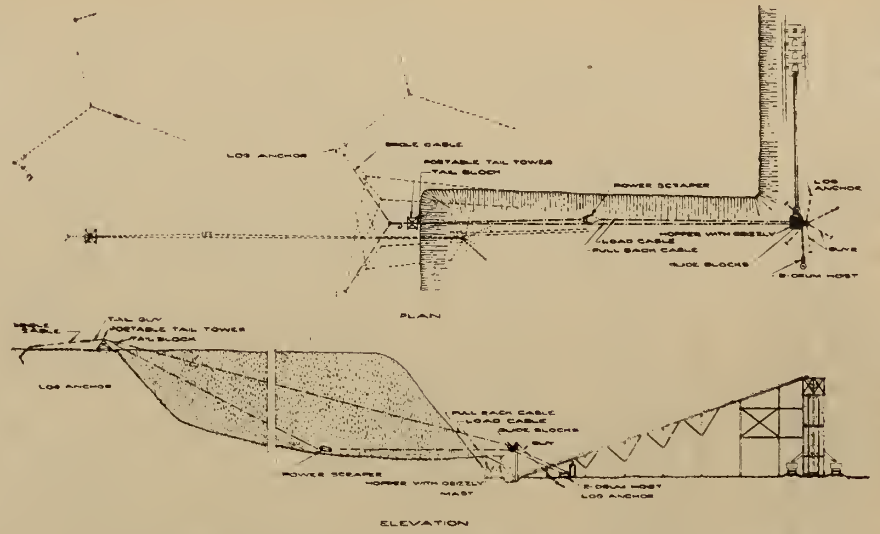


Fig. 4—Typical power scraper installation for large sand and gravel plant

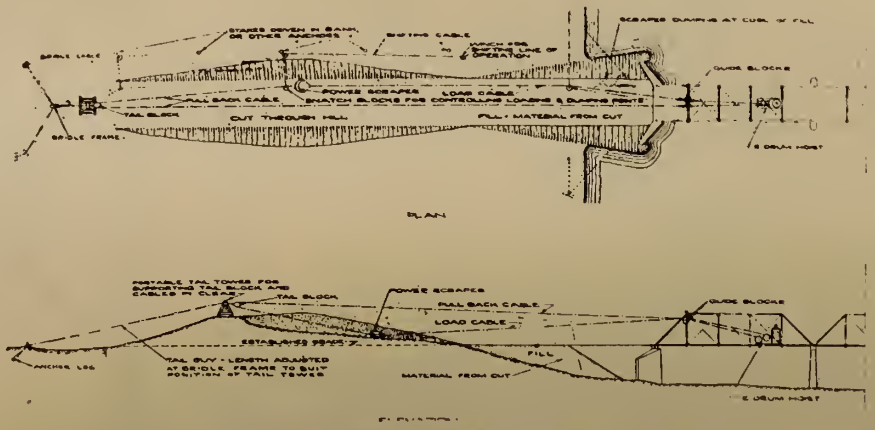

STAKES DRIVEN IN BANK, OR OTHER ANCHORS
SHIFTING CABLE
WINCH FOR SHIFTING LINE OF OPERATION
SCRAPER DUMPING AT CURL OF FILL
BRIDLE CABLE
POWER SCRAPER
LOAD CABLE
PULL BACK CABLE
SNATCH BLOCKS FOR CONTROLLING LOADING & DUMPING POINTS
GUIDE BLOCKS
TAIL BLOCK
CUT THROUGH HILL
FILL - MATERIAL FROM CUT
BRIDLE FRAME
2 DRUM HOIST
PLAN
PORTABLE TAIL TOWER FOR SUPPORTING TAIL BLOCK AND CABLES IN CLEAR
TAIL BLOCK
POWER SCRAPER
PULL BACK CABLE
LOAD CABLE
GUIDE BLOCKS
ESTABLISHED GRADE
FILL
ANCHOR LOG
TAIL GUY - LENGTH ADJUSTED AT BRIDLE FRAME TO SUIT POSITION OF TAIL TOWER
MATERIAL FROM CUT
2 DRUM HOIST
ELEVATION

Fig. 5—Power scraper installation for making cut and fill

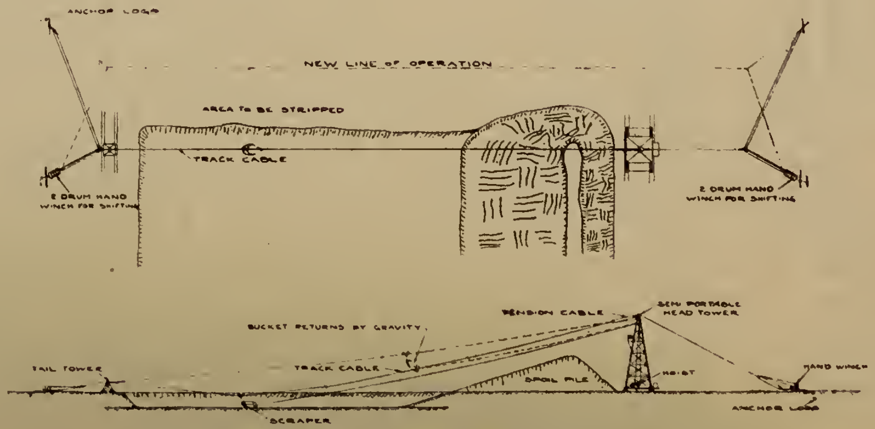


Fig. 6—Power scraper on slackline cableway for high spoil piles or levees

outputs ranging from 1,000 to 2,000 tons per day are using large size scrapers and their cost records prove that this is the most economical method of carrying on large scale operations when the deposit is on high ground.

A leading factor in favor of the power scraper as the excavating unit on these big bank propositions is the great flexibility possible in its operation. Almost any reasonable capacity which conditions may demand from the plant can be met by the scraper for long periods of time. When the pit becomes too large for the scraper to handle the desired daily tonnage of material direct to the plant, the problem is easily solved by installing a belt conveyor as an auxiliary to the scraper system.

Making Cuts and Fills and Grading

Exceptionally good results have been obtained with power scrapers in handling grading and excavating jobs. Perhaps the most frequent of these applications is for making cuts and fills where the total haul of the material does not exceed some 500 or 600 feet. Longer hauls have been handled satisfactorily under special conditions.

Over the distances mentioned the material can be excavated, conveyed, and placed in the fill in one operation, and the advantages where this can be done will be obvious.

Tough clay or other stubborn top-soil is no obstacle to using scrapers: Frequently the fill is over wet or marshy ground and the scraper does away with the necessity for any trestle or provision for support required by other types of equipment.

When working in water the success of the scraper is contingent only upon the nature of the material handled. Some materials have a distinct tendency to become "soupy" when handled under water, and these can best be handled with a dragline cableway. A large number of jobs have been successfully handled with power scrapers where the material has been excavated under water and the fill made along the shore line for filling low land and deepening the adjacent water front.

Stripping Overburden and Similar Work

There are a large number of excavating operations which come under the class of stripping overburden. This may be for the uncovering of gravel, clay, stone, coal, or various other mineral deposits. For many of these, the power scraper has distinct advantages which should be given consideration.

Where the overburden need not be moved further than 300 to 500 feet and particularly where the spoil can be deposited in a ravine or other deep place at the edge of the area to be stripped, the standard scraper installation with suitable provision for shifting the line of operation may be easily and safely installed.

Where the area is flat and the spoil must be placed in a window at one side of the excavation, a high tower is necessary to prevent pulling the cable through the spoil pile. The height of this tower can be taken advantage of for a slackline gravity return arrangement similar to the installation shown in Fig. 6.

Storing and Reclaiming Loose Materials

By many, scrapers are considered the most economical equipment for ground storage of coal. Now large gravel plants, crushed stone producers, gypsum companies and others are adopting this simple scheme for stocking out and storing the production of their plants during the periods of light demand and for reclaiming and loading this stored material at times when the market demand exceeds the plant capacity. ¾

The chief advantages of a scraper system for ground storage of crushed rock, gravel, sand, etc., are that it is easy to operate, easy to repair with unskilled labor, can be extended at small exxpense to cover a larger storage area when necessary, and is able to handle either large or small tonnages economically.

The Annual Financial Review

It is often said that every business should have a fair percentage of its assets invested in good securities to act as an anchor in time of trouble. Sometimes the surplus assets go back into the business; sometimes they are kept in the bank but—sometimes—they are used to buy L. R. Steel or other worthless stock.

The Annual Financial Review published each year by Houston's Standard Publications, Toronto, contains valuable and entirely reliable data on all securities listed on the Toronto and Montreal Stock Exchanges, as well as on many other Canadian undertakings. It contains the current annual statements of companies; the highest and lowest prices of stocks and bonds (government, industrial,, municipal, etc.) for each month for ten years; rate of earnings and dividends paid for several years and other important items in the history of the different companies such as increases in capital stock, particulars of franchises, dates bonds are redeemable, and a mass of other facts which, taken together, enable the investor to make a personal study of any security before spending his money. The book has grown until the last edition, just off the press, which brings everything up to date of June 1923, contains 792 pages; cost $10.00. It is an invaluable book for the general investing public.

Letters Explain Manufacture of Gears

Practical and interesting information with regard to gears is contained in a series of twenty letters which have recently been gotten out by the Hamilton Gear & Machine Company, 62-100 Van Horne St., Toronto. This firm specialize in the cutting of gears and have what is considered one of the finest plants in Canada for this purpose. They also handle a certain amount of custom work for which their equipment is especially suited, such as turret lathe, large boring mill or milling machine work, case hardening and steel treating.

The letters referred to give brief descriptions of gear materials, processes of manufacturing gears, hints on the care and adjustment of gears, as well as some technical data concerning the design of gears of all types. These letters are sent to customers and prospective customers of the firm and, no doubt, will perform an excellent service by giving them splendid educational matter relating to gears.

Houses are being built in England and Wales at the rate of 67,000 a year. About half of this number are constructed under the government housing plan, whereby the government pays a percentage of the cost. The remainder are being erected by private enterprise.

Will Toronto Permit Gypsum Wall Board?

Contracting Plasterers' Association Oppose Change in Building By-Laws—Gypsum Industries Refute Opposing Arguments—Tests to be Conducted

In connection with the revision of the building by-laws of Toronto, some effort has been made to permit the use of gypsum wall board in place of lath and plaster. This movement has been opposed by the local plastering contractors' association who addressed a letter on the subect to the Property Committee of the city. In order to explain the whole situation this letter, together with a reply from the Gypsum Industries and the Ontario Gypsum Co. are printed below:

Toronto, October 6, 1923.

The Chairman and Members of the Property Committee, Toronto:

Gentlemen,—

We the Contracting Plasterers' Association of Toronto, wish to strenuously oppose any amendment to the Building By-Laws of the City, which would permit the use of wall board as a substitute for lath and plaster. We feel that such an amendment would be a retrograde movement from a sanitary, fireproof and stability point of view, and herein beg to give a few of the reasons for our so thinking.

In Chicago and Detroit, for instance, this board is permitted on buildings of ordinary construction as a substitute for wood lath, but it must be plastered upon in two coats of hard plaster and is not permitted as a finish, substituting lath and plaster. Some years ago fire tests were made in Chicago of wood lath and two coats of plaster with ordinary key, and plaster board covered with two coats plaster, and the result was that each stood about 15 minutes of fire rising from zero to 1800 degrees Fahrenheit. At the end of the said 15 minutes the studding at the back of both was burning. In recent tests before the Underwriters' Laboratories in Chicago of three coats of plaster on metal lath, a result of 45 minutes of fire rating at 1800 degrees was recorded, which we think no plaster board or gypsum board can even approximate. Unplastered plaster board and compo boards all lack backbone and do not become an integral part of a building, as does plaster. They are subject, unplastered, to breakage and are hard to repair. The natural shrinkage of a building results in the joint filler falling out and thus you have many open joints resulting in air currents for the easy passage of fire and sound; such open joints also allow the passage of vermin, which when they get back of such finish, cannot be got rid of in a building. While it is unfortunately true, in the absence of proper inspection, that much bad plastering is done under the competitive system, and the indifference of some of the men and contractors, wall board used under like conditions will be just as effectively "skinned." Careful consideration of these points alone will show clearly the infinite superiority of plaster over unplastered wall board. Even the use of wood lath with thousands of lath nailed with hundreds of thousands of nails, and all this in small units, add greatly to the structural strength of a building of ordinary construction.

In New York, the by-laws demand that this board if used, must be covered with three coats of hard plaster mortar, after the joints have first been filled with plaster mortar, but no mention is made of its being used as a finish, and in the Chicago by-laws no mention is made of this material at all, proving in our estimation that the authorities do not consider it as a fitting substitute for lath and plaster.

In Milwaukee, some such amendment was sought as is being asked for here, and after exhaustive enquiry and tests, it was decided to allow its use providing that the board should be made the thickness demanded in the by-law for plaster. This had the effect of killing the proposition as the manufacturers of the board could not make it cheap enough to compete with plaster.

In Pueblo, Colorado, three houses in a row, attached, were through certain circumstances treated differently, one was wood lathed and plastered, one metal lathed and plastered, and the other was finished with wall board. A fire started in the one wood lathed and spread through the whole three and the first to collapse was the one which caught last, viz: that with the plaster board finish. When the fire was extinguished, it was found that through the action of the water the plaster board had disintegrated and fallen away from the nails, which were still in the joists, whereas the wood lath was in places intact, while the metal lath and plaster had stood up and evidently retarded the fire. We have written to Pueblo for the whole facts, and hope to have these for your perusal.

While in convention in Denver, we were addressed by F. Healy, Esq., fire chief of that city and president of the Fire Chiefs' Association in 1920, who warned us against the use of these boards, stating that wherever same had been used and fires had occurred, he had experienced greater difficulty in extinguishing the fire. He spoke strongly as to the superiority of lath, especially metal lath and plaster, and hoped to see the day when the city of Denver would use something else, anticipating that such a happening would considerably lessen the work of his department.

We should be glad to make up samples of all three, viz: wood lath and two coats of plaster, plaster board as a finish, and metal lath and plaster, built up as they would be in the ordinary house on wood studs and then give them the fire test before your committee, should you so wish.

There is a health by-law which demands that all paper shall be stripped from a wall before redecorating. What would happen to the covering of these boards when such stripping takes place, why it would be taken off and the board still farther deteriorated.

In conclusion we would call attention to the fact that the majority of these houses are sold to working and office men, who in the ordinary course of life have children who are prone to cause considerable breakage of wall surfaces. In the case of plastered walls this is easily remedied, but in the case of such a finish as is asked for the repairing would be costly, and the worker, who can ill afford it would have to bear it after paying a price for his building that should guarantee a good well-finished home.

Yours truly,
Contracting Plasterers' Association.
A. E. Flower,
Secretary,

The reply to the above arguments is as follows:

October 12th, 1923.

The Chairman and Members of
the Property Committee,
City Council,
Toronto, Ontario, Canada.

Gentlemen:

The attached is a copy of a letter prepared by a representative of The Contracting Plasterers' Association and submitted to the Toronto City Council on Property, at a meeting held on Monday, October 8th, 1923. The purpose of this letter, which is misleading, not in accordance with the facts, and untruthful, is self evident. As was admitted at the meeting, the contracting plasterers are afraid that recognition of, and economies incidental to, the use of incombustible gypsum wall board, will tend to a curtailment of the plaster business, from a labor point of view, because gypsum wall boards can be erected satisfactorily by carpenter labor. Also, the letter is misleading and not within the truth for the following reasons:

(1) Throughout the text reference, which is confusing, is made to gypsum **plaster** board which is not a gypsum **wall** board in that it is made to be plastered upon. Gypsum **wall** boards are manufactured to be used as a finish for the interior partitions, walls and ceilings of buildings without the addition of plaster.

(2) The issue is further confused by reference to a fire test conducted at the Underwriters' Laboratories, Inc., upon expanded metal lath and gypsum plaster. This test, known as Retardant No. 1355 and bearing date of August 10, 1922, does not apply since it developed a degree of fire protection of 1¼ hours and for this reason has received a fire protection rating of one hour.

The matter at issue involves gypsum wall boards, and also wood lath plastered to ½ inch grounds with ordinary (lime) plaster, which were tested in a precisely similar manner at the Underwriters' Laboratories, Inc., and reported by them, under dates of March 1st, 1920 and June 26, 1921, as Retardant No. 1006 and No. 1319 respectively. When comprising the fire resistance of gypsum wall board (without plaster) and wood lath plastered to ½ inch grounds with ordinary (lime) plaster, page 72 of Retardant No. 1319 states:

"These periods (of fire resistance) are approximately double those obtained in the (fire) tests of panels in which wood lath and plaster finish of average quality was employed."

(3) The test referred to by the Contracting Plasterers' Association, as having been made some years ago in Chicago, does not apply to the case in question since the test involved gypsum plaster upon **wood lath** and upon **plaster board.** The claim set forth by the Ontario Gypsum Company, Ltd., is that their gypsum **wall** board (without plaster) is superior to **wood lath** plastered to ½ inch grounds with **lime plaster,** a procedure permitted under the Toronto building by-laws. This fact is vouched for in report of tests conducted at the Underwriters' Laboratories, and known as Retardants No. 1006 and 1319.

Strength of Gypsum Wall Board

(4) The Contracting Plasterers' Association's statement to the effect that unplastered plaster board and Compo boards all lack backbone, do not become an integral part of a building and are subject to breakage, hard to repair, etc., is not correct and is misleading. In the first place, wall pulp boards have never been tested or approved as suitable fire retardants by the Underwriters' Laboratories, as have incombustible gypsum wall boards. When considering the strength of gypsum wall board, tests have been conducted at Armour Institute of Technology by Professor G. F. Gebhardt in which, from a strength point of view, gypsum wall board was compared to the usual **wood** sheathing or shiplap. The report concludes with the following:

"These results prove conclusively that wood framing sheathed with the gypsum wall board instead of the usual shiplap produces a stronger building that is more resistive to wind stresses, settling and lumber shrinkage, all of which warp and twist the building from its original shape. Gypsum wall board sheathing, therefore, offers far greater protection than wood sheathing from plaster cracks, split floors, distorted trim, and door and window troubles."

Also, when referring to strength, water saturation and similar features, (points raised as reasons for objecting to the use of gypsum wall board, by the Contracting Plasters' Association), page 49 of Retardant No. 1319, published by the Underwriters' Laboratories states:

"The results of the load test indicate that where the gypsum wall board is properly attached, the ceiling finish is capable of sustaining water load of about fifty pounds per running foot along the spaces between joists spaced 16 inches on centers, and that it is capable of doing this after it has been wet for about forty-five minutes. The results show a high factor of safety in the strength of the boards and attachment under normal service conditions and even when the boards are wet by leaky plumbing or overflows."

A Factory-Made Product

(5) The Contracting Plasterers' Ass'n. state that because of the lack of proper inspection much bad plastering is done and for the same reason gypsum wall board used under similar conditions will be just as effectively "skinned." This statement is not within the truth and fails to admit the superiority of a factory-made product when compared with lime plaster which is subject to oversanding, poor sand and improper mixing and application. Gypsum wall board must meet whatever requirement the city architect or the building by-law may impose. It is a factory-made and factory-inspected product and can be tested and inspected on the building site or operation before approval or erection. This point alone shows clearly the infinite superiority of gypsum wall board over wood lath and lime plaster—the plaster being subject to the deteriorating action of oversanding or poor sand, and the wood lath acting as so much kindling wood in the spread of fire through hollow partitions.

(6) With reference to statements made by the Contracting Plasterers' Association as to the attitude of other large cities on the use of gypsum wall board.

the following are the facts which can be substantiated at any time by simple correspondence.

New York City.—Accepted, by written approvals, (without plaster) as a finish for the interior walls, partitions and ceilings, by the boroughs of Manhattan, Bronx, Brooklyn and Queens, respectively. Also, the New York state and New York tenement house departments.

Chicago.—Use of gypsum wall board (without plaster) opposed by the building department and the plasterers' organizations. Matter taken to the Circuit Court on March 14, 1919, this court rendering verdict supporting the Chicago building code of 1911 (Section 605). Matter appealed to the Supreme Court of Illinois, October Term, 1919, which reversed the decree in opinion rendered which concluded with the following paragraph:

"We believe the ordinance in question is unjust and oppressive in its discrimination as to the material to be used for the partitions and ceilings of the rooms in ordinary dwelling houses. This being so, it must be held that these provisions of the ordinance are void and should have been so declared by the trial court. The decree is reversed and the cause remanded."

As a result of the supreme court decision and fire, water and strength tests conducted at the Underwriters' Laboratories, and thermal conductivity, impact, static load, air infiltration and bacteriology tests conducted at Armour Institute of Technology, gypsum wall boards (without plaster) are approved wherever under the building laws combustible wood lath and ordinary plaster is required or is permitted. These approvals include, Albany, Rochester, Mount Vernon, Troy, Philadelphia, Washington, D.C., Cleveland, Toledo, Detroit, Grand Rapids, etc. With regard to the use of gypsum wall board in Canada, Toronto appears to be the only important city that has raised objections.

What the Underwriters' Laboratories Claim

(7) Derogatory statements as to the fire resistance, durability, strength and other physical features of gypsum wall board are contained in the Contracting Plasterers' Association's letter of October 6, 1923, and were verified in person by their representative who appeared at meeting of the Property Committee on October 8, 1923. These untruthful, misleading and incorrect statements are all refuted in Retardant reports No. 1006 and 1319 of the Underwriter's Laboratories, which involved the following: "Practicability, durability, strength, fire resisting properties, uniformity and service record."

It is not possible, within the space of this communication to quote the approvals granted under each of the above quoted listings. Since we are vitally interested in actual service conditions, page 65 of Retardant No. 1319 states:

"Letters submitted from users, contractors, architects and dealers in various sections of the country testify that the material has given highly satisfactory results. These letters show that it is practical to handle and ship in carload lots without excessive breakage or injury, that it can be so installed as to give a suitable appearance and affords a superior unit wall and ceiling covering and that it possesses sufficient strength and withstands service conditions in an acceptable manner. Particular reference is made to the stability and non-warping nature, several cases in which it had been wetted and dried out without material injury being reported; to its non-conductivity, and to its uniformity and decorative possibilities. Favorable results in one (actual) fire are reported."

(8) The Contracting Plasterers' Association letter of October 6th, refers to a "health by-law which demands that all paper shall be stripped from the wall before redecorating," and further states, "what would happen to the covering of these boards when such stripping takes place? Why, it would be taken off and the board still further deteriorated."

The above quoted statement does not agree with the actual service conditions determined after correspondence and field inspection by the Underwriters' Laboratories. Just as for other surfaces that are to be decorated with paper, the surface of gypsum wall board must be sized, and when so treated can be papered or painted indefinitely. Gypsum wall boards are manufactured with this very necessary requirement in view.

(9) The Contracting Plasterers' Association letter makes reference to a fire in Pueblo, Colorado which was unfavorable to gypsum wall board. Under date of October 10, 1923 a night letter wire was sent to Mr. John M. Jackson, Mayor of Pueblo, as follows: "Kindly wire our expense facts concerning fire which spread over three houses one of which was finished inside with wall board. Was this incombustible gypsum wall board of kind approved by Underwriters' Laboratories and found after fire tests to be better for fire protection than wood lath and ordinary plaster?"

On October 11, 1923, the following answer was received: "Chief of fire department has no record of any fire such as described in your wire." Signed, "John M. Jackson, President of Council."

The answer quoted is of particular interest since a description of the Pueblo, Colorado fire, which involved different types of interior finish in three adjacent houses, is minutely described in letter of the Contracting Plasterers' Association.

A somewhat similar telegram was sent to Mr. J. F. Healy, fire chief of Denver, Colorado, who wired reply as follows: "Am mailing copy of letter covering my views in reference to gypsum board."

Basis of Claims for Consideration

(10) In conclusion I would advise that the claims of the Gypsum Industries, and the Ontario Gypsum Company, Ltd., for consideration of gypsum wall board in the Toronto building by-laws, as a substitute for wood lath and lime plaster wherever, under the by-laws, wood lath and lime plaster is required or is permitted, are based upon the following:

(a) The favorable report of the Toronto City Architect submitted to the Property Committee by Mr. J. J. Woolnough.

(b) The approvals, for the purpose intended after fire, water, strength and service tests conducted by the Underwriters' Laboratories, and reported by them as Retardant No. 1006 and No. 1319.

(c) The approvals, after investigation, by New York, New York State, Philadelphia, and other large cities.

(d) The recommendations of the United States Department of Commerce as contained in their published code for dwelling houses.

(e) The recommendations of the Committee on Building Construction of the National Fire Protection Association as contained in their published report for 1923.

(f) The decision rendered in favor of gypsum wall board by the Supreme Court of Illinois, U.S.A.

(g) Favorable opinions expressed in letters from the Comptroller of the Metropolitan Life Insurance Company, the Secretary of the Boston Board of Fire Underwriters, the Schedule Rating office of New Jersey State, and letters of commendation and approval from architects, contractors, supply dealers, and owners.

I would advise that since the Contracting Plasterers' Association has requested that a comparative fire test be conducted, and the Property Committee was of the opinion that in spite of the evidence submitted such a test would prove of value, the Gypsum Industries and the Ontario Gypsum Company, Ltd., will co-operate in the conduct of such a test and will be governed by the results obtained, the report submitted upon the evidence of the fire test, and the final action of the Property Committee and the City Architect as to the approval of gypsum wall board or its rejection.

The Toronto building by-laws permit, in certain types of buildings, the use of wood lath and lime plaster applied in two coat work to ½ inch grounds. The thickness of the grounds, following standard practice, to include the thickness of the wood lath.

Since it is only upon a parity with the above described wood lath and lime plaster construction that the use of gypsum wall board (without plaster) is requested, the contemplated fire test will be carried out by the city architect upon a panel of wood lath and lime plaster and a panel of gypsum wall board. It is understood that the city architect, not having facilities for the conduct of fire tests, is agreeable to having the desired tests carried out at the University of Toronto by Professor Peter Gillespie.

The writer, a graduate of Toronto University, and an active member of the leading engineering societies, places these facts before you for your fair and unpartial consideration, and with the conviction that efforts in the interests of the more extended use of gypsum building products, consistent with their suitability for the purposes intended, is a step forward and will contribute to legitimate competition and consequent lower building costs. Also gypsum is plentiful in the province of Ontario and elsewhere in the Dominion of Canada.

Respectfully submitted,
THE GYPSUM INDUSTRIES
Virgil G. Marani,
Chief Engineer.

Time to Stop Underbidding the Other Fellow

The Practice is Too Prevalent of Tendering Just to Beat Competitors —Many Items Involved in the Cost are Overlooked and Contractors Get in Deep Water

By J. S. Gilman in "The Earth Mover"

A deplorable condition exists in the construction field. Present prices for grading, paving, ditching, etc., are too low, out of all proportion to the cost of the work. And the contractor is to blame.

In the first place, many contractors today are not bidding for work on its merits or to make a fair profit. Instead they go to a letting, look over those present, examine the hotel register, and if they discover an active competitor cut their bid to beat him, no matter how much or what price. This, regardless of costs they have compiled, which have cost them good money to obtain, only now to be thrown away simply to beat the other contractor. This perhaps is the greatest curse in contracting today, and what is needed is men strong enough to stand by their convictions, and bid work for what it is worth, regardless of anyone else.

It is reasonably certain that at present, road work at 21 cents to 26 cents is not profitable; paving cannot be laid under present standard specifications no matter what system you use—under $25,000.00 per mile (and that's cheap); while ditch work at 5 to 7 cents is an insult to normal intelligence. Regarding railroad work, it is quite uncertain at present what is a fair price, for conditions have changed materially since there was any volume offered. However its redeeming features are yardage, classification and no "hand" finishing.

Costs Are Disregarded

What is a fair price would not be difficult to ascertain, and it is quite probable, if a dozen contractors sat down at the same table to figure the cost of a certain job, that their final results would not be very far apart; but it is not being done, and therefore, a disregard of costs brings the present chaotic conditions.

In the second place what are costs? They are the different items you pay for, during your performance of a contract, such as overhead and it is put first because it leads all items in importance and receives the least attention of all, particularly from the smaller contractors. Many of them claim they do not have any, because they don't hire a bookkeeper or foreman; the wife does the cooking, and the kids drive teams. If they have more money in the bank at the end of the year than they had at the beginning, they have made a profit. Well, have they? Let's see about overhead—a camp site often costs considerable, postage, telephone and telegrams, stationery, oil and gasoline, auto upkeep (they all have one and generally not a Ford.) These items ought to firmly establish overhead. Now, what about insurance, depreciation, plant rental, repairs, replacements, and contingencies? These terms may sound very modern to a regular dirt mover, but are vital to his business today and the quicker he understands them and applies them to his affairs, the sooner we will be on the road to better prices and fair profits. In a certain section of the country work that was completed by a contractor in October, 1922, was not paid for by the government until May and June, 1923. Did the contractor receive interest during that time? Not at all, but all the while he was paying interest on the funds he had borrowed to finance the job.

A third reason for unsound conditions is the automobile. Very few contractors of the younger generation can stand prosperity, and the minute a small balance shows on the right side of the ledger they at once proceed to blow it on a big car or other things equally foolish. This of course only applies where contractors are not firmly established. However, two cases are known where contractors purchased large autos before their bank balance was assured, with the results that one of them has been able to weather the storm only by reason of new capital being brought to his company. The other party now is in the hands of banking and bonding interests.

The automobile in construction has become indispensable, and is saving thousands of dollars daily in taking men to and from jobs, hauling foodstuffs, repair parts, etc., but unless its operation is included in the costs, it soon becomes a liability, not an asset.

At one recent county letting, there were parked around the court house square, during the hour of the letting, some fifty automobiles, and their operation is chargeable to some account.

The fourth and last item of interest is bonds and banks, both of which play a very important part in there respective fields. However, each has more or less seemingly tried to displace the other with the contractor and a serious situation has been the result.

Banks and Bonds

Years ago it was the custom for the contractor to submit with his bid a certified check as a guarantee of his performance of the contract but of late we have heard a great deal of the bidder's bond, and its use has nearly eliminated the certified check. On examining the results of this change, we find many contractors obtaining more work than they can finance. They therefore make a loan at the bank. During the high prices they were able to meet their obligations, but the time came when they could not pay their notes, and the bank in order to furnish additional funds, placed a mortgage on the outfit. In this way many country banks in particular have now come to own the outfits. That many of them are losing money for the banks there is no doubt, and those contractors who still have an equity in their plant are now working either for that plant or for the bank. At present prices they may be able to pay labor and feed their stock but there will be nothing left in the way of profit to apply on the notes held by the bank.

Recently a responsible bonding company wrote a bond for a contractor for some $250,000,00 on a job of 300,000 yards of road work, knowing at the time that this contractor had unfinished jobs on which he was having trouble, and that he was indebted to a bank to the amount of $35,000.00. Now the bonding company has taken over the job, and has had to relet it at a considerable advance in price, the company of course having to stand the difference.

What the final outcome of the present situation will be no one can at this time determine, but it certainly is the hour for each individual to stop contracting for cheap work simply to underbid the other fellow.

Three Tons of Material Per Ton of Cement

For every ton of portland cement shipped, over two and a half tons of raw material and cement clinker must be ground to the fineness of flour.

In addition, half a ton of coal or equivalent fuel is burned in manufacturing a ton of cement, and most of this must be ground to equal fineness, making nearly three tons of material pulverized for one ton of cement.

Letters to the Editor

Hot Water Heating

October 12, 1923.

Editor, Contract Record:

I was very much interested in the article appearing in your issue of September 26th entitled "Is Hot Water Heating Preferable?" by B. W. Randolph, M.E.

I read the article through several times hoping to find some data to substantiate the sweeping claims made for hot water heating but, with one exception, failed to find anything more than a collection of arbitrary statements, the exception being the statement in the second paragraph wherein the author states that the hot water system requires only enough coal to heat the water to the desired temperature of the plant. On the face of it this statement is startling and it would be extremely interesting I believe to engineers if Mr. Randolph would supply figures to show how he arrives at such a deduction.

I feel that the readers of your paper are entitled to some data to support the sweeping claims made by Mr. Randolph for hot water heating as I consider the claims far too broad and consequently misleading to a dangerous degree. However I do not claim to know it all and will await with much interest any data that Mr. Randolph may be able to produce in support of his sweeping statements.

Trusting that you may find space to publish this request for further information, I beg to remain, Sir,

Yours truly,

R. F. Eagar,
Lecturer in Heating and Ventilating
Engineering, Nova Scotia Technical
College, Halifax, N. S.

Believes in All-Year-Round Construction

Editor, Contract Record:

We wish to compliment you on your article on page 935 of the October 3rd issue entitled "Winter Need Offer No Obstacle to Building." This article is very timely, and we believe should be followed up by a number from your pen in the next few issues. To our mind, construction work can be carried out on a twelve-month program in Canada. Records show that only about one winter in five can be termed severe, and if a more or less continuous program was carried out during the twelve months, we believe the peak prices in the so-called construction months would be a thing of the past. Now-a-days, those in the building trades believe that they must get sufficient wages during the eight months of the year so hat they can be idle for the other four. This condition is not healthy.

Yours truly,
Canadian Brass Company, Limited
per Geo. F. Fisher, Manager

Should Local Materials be Used on Roads?

The Selection of Types of Asphalt Pavements with Reference to Local Materials—The Engineer's Responsibility in Interpreting the Specifications

By ROY M. GREEN*

Regardless of the manifest importance of the road problem in every city we still find that the laymen of the various cities, through their city councils, or commissions, feel justified in taking from the hands of their engineers the important problem of the selection of the type of pavement to be used in any location. The success of the street system as a transportation medium is entirely dependent upon this selection, yet many members of city councils feel themselves qualified to select the types of pavement to be used. These same men would hesitate to even make a recommendation regarding the design of a sewer or water-supply system, where much less money is involved in the enterprise.

Although it is manifestly a fact that this authority should be vested in the engineer we are still confronted with the condition in many localities where the law delegates this authority to the city council, or even worse, to the abutting property owners within the district to be paved. Without any question, this reacts against the best interests of the public and results in improper selecions in many instances, and is one of the greatest contributing causes of the short average life of the pavements.

Even though the engineer is confronted with this condition he still has great authority in making the selection of type through the fact that he still has practically unlimited authority in the drafting of the specifications for the work contemplated. Let us call this, selection of type by specifications. Unfortunately the engineer too often overlooks the fact that he has this authority and hastily draws up his specifications by simply adopting the standard specifications of one of the national societies that have adopted such standards, never realizing that his client may suffer great financial loss through such procedure.

The blind use of standard specifications is poor engineering and results, in many cases, in higher costs to the owner without a corresponding improvement in the quality of the finished product. On the other hand, it is likewise very poor engineering to specify for the use of local materials without first making a very thorough investigation of these materials. Furthermore, such an investigation should not simply include the usual laboratory tests of these materials but should embrace a thorough examination of the deposits, methods of production, quality and uniformity as well as quality of the material itself. These investigations should be carried on only by persons who are thoroughly qualified, through years of experience in the construction of asphalt pavements, for if they are not, the entire expenditure of the owner's money is then being placed upon an experimental basis, which is a condition never justifiable under any circumstances.

If this procedure is followed it will be possible for the engineer to exercise great influence in the selection of type with reference to local materials if he makes a thorough investigation of the availability of materials of all kinds and then makes sure to include in his specifications a description of the type that can be constructed by using the greatest quantity of low priced material of a quality that is entirely satisfactory for the purpose intended. As soon as bids are received under these specifications the price bid on this type should be low enough to make the selection almost inevitable.

Abuse of Selection by Specification

Allow me to take two illustrations from cases that have come to my attention in our practice. In one city an engineer asked for bids upon sheet asphalt and asphaltic concrete, coarse aggregate type (in this case called Bitulithic). The specifications for the large aggregate for the asphaltic concrete allowed the use of a very inferior grade of broken stone and as a result an aggregate was used having a toughness of only four when tested by the Page impact machine. To have obtained satisfactory large aggregate of broken stone for this work would have required its being shipped for a distance of over 500 miles and from another State at a very high freight rate.

On the other hand, the large aggregate for use in the binder course of sheet asphalt was described in such a way that it required an aggregate of a toughness of 10 and a French coefficient of wear of not less than eight and made it necessary to ship this material a distance of over 500 miles while there were good commercial deposits of gravel containing materials that would have been entirely satisfactory for that purpose within a distance of less than 50 miles. All other aggregates entering into the construction of the sheet asphalt pavement were even nearer than this with the exception of the stone dust for filler. The engineer either abused the privilege of selection by specifications and decided the owners' confidence and wasted their money or he was ignorant. In this case, I believe that it was the former because he specified also that the binder for the sheet asphalt should contain 7% of limestone dust. The city is no longer a client of the engineer.

Proper Use of Selection by Specification

On the other hand, let us consider another illustration, where specifications were drawn with the intention of utilizing available materials to the greatest advantage. The city, through their engineer, adopted a specification, which incidentally is not in accordance with any of the standard specifications for large aggregate for binder construction, but is good practice and has been demonstrated as being satisfactory for the work contemplated. Through the use of these specifications, instead of the adoption of one of the standard specifications, the most economical selection was apparent to any unprejudiced party and resulted in the saving of approximately $50 000 on a two year paving program and the quality of the work did not suffer in the least detail. All the aggregates for this work were obtained within 5 miles of the improvement with the exception of the limestone filler.

In closing, however, I wish to again sound the word of warning against the adoption of any local materials or special specifications unless their adoption is thoroughly investigated by one who is unquestionably qualified to pass judgment upon their utilization for the work contemplated as it would be a serious error in policy to place the expenditure of public money, in such great quantities, upon an experimental basis and it would react against the best interests of all concerned in the construction of roads and pavements.

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*Manager, Western Laboratories, Lincoln, Neb., before the recent convention of the Asphalt Association.

For the Building Supply Dealer

Twenty Years Consistent Development

J. Muldoon Ltd. Have Steadily Grown as the City Has Expanded—The Principles That Have Governed Their Business

"Turnover." That is the watch-word of the business of J. Muldoon, Ltd., the secret of their success, according to Mr. John J. Wright, the manager. J. Muldoon, Ltd., are building supply dealers who, during the twenty years of their existence, have consistently grown and built up an ever-increasing business. With two yards in Toronto, they are well equipped to care for the needs of contractors as far as building supplies are concerned. These yards are located in close proximity to those districts of the city which are experiencing active building operations and, consequently, the firm have been able to develop a splendid local trade that has become the backbone of their business. Muldoon's pride themselves on their staunch adherence to principles of real service and one point on their service program is rapidity of turnover, ensuring to their customers at all times a fresh stock, unimpaired by lengthy and sometimes deteriorating storage. Thus it is that the word "turnover" was used to explain the nature and the consistent growth of the J. Muldoon, Ltd., business.

The business first took form twenty years ago when Mr. J. Muldoon established a building supply yard at the corner of Queen St. and Gladstone Ave., Toronto. Of course, business began in a small way at first—indeed one horse and rig sufficed as the delivery force—but Mr. Muldoon was thoroughly versed in the things that are requisite for the development of a good supply business. Furthermore, he was aggressive and before long he began to see his business grow until just three years after he commenced, he had to open a new yard at Bloor St. and Perth Ave., on the C. P. R. The opening of this new yard only seemed to add impetus to the growth of the business and so, in 1913, a third yard was opened still further north in the city, at St. Clair Ave. and the G. T. R. tracks. At the same time, a limited company was formed, the firm becoming known as J. Muldoon, Ltd. When the company established on St. Clair Ave., they took over the firm of Rogers and McKeown, who had been established for some time at that location as building supply dealers. For four years following the organization of the company, the three yards were kept open, but in 1917 the head office was moved from Queen St. and Gladstone Ave. to St. Clair Ave., and the former yard closed. At the present time, therefore, the company have two offices —at 1615 St. Clair Ave. West and Bloor St. and Perth Ave.

In making these various moves the firm was always influenced by the expansion of the city and sought to establish its yards in close proximity to the scene of active building. In other words, as Mr. Wright put it, "we have not waited for building to come to us, we have gone directly to the building." This policy of establishing close to the rapidly developing suburbs has contributed very materially to the success of the business. It has proved very profitable, indeed, to be right on the ground, so to speak.

While Mr. J. Muldoon, the founder of the business, has been and still is active in its affairs, being president, he has associated with him as members of the company men who are keen and aggressive in the interests of the firm and who have all contributed to the rapid development of the business in recent years. Mr. J. J. Wright, previously referred to, is vice-president and manager. Although he joined J. Muldoon, Ltd. only in 1922, he has had considerable experience in the supply business, having been formerly associated with Alfred Rogers, Ltd., and the Rogers Supply Co. for a period of twelve years. Mr. J. C. West first became associated with Mr. Muldoon in 1910 and on the organization of the company was appointed secretary-treasurer. The sales manager is

J. Muldoon Ltd. pride themselves on their delivery equipment. Bo

Mr. P. B. Macdonald, whose connection with the firm dates from 1918.

Asked for an explanation of the growth of their business, Mr. Wright stated: "Service and good management. We are able to supply anything the contractor needs—with the exception of lumber, of course, which is a specialized line—and we are jealous of the service that we are able to render to our customers. Delivery of any commodity in retail or wholesale lots can be made promptly and with the elimination of all worry and trouble on the part of the contractor."

This naturally lead to some questions about the delivery system and the Contract Record representative was informed that the company had ten trucks, six teams and one single—a splendid delivery equipment that is bound to ensure the utmost service as far as delivery is concerned. If there is one thing that J. Muldoon, Ltd., have tried to excel in, that is delivery, and the reason they have developed this aspect of their business so highly is that they have been willing to spend the money on the necessary equipment. Trucks have been used for a number of years, because of their recognized advantages, especially for long hauls.

The furnishing of supplies for house building forms a large part of Muldoon's business. For the development of this phase of their trade, they are well located, having yards close to the rapidly developing northern and western sections of Toronto. In addition, of course, they cater to the large jobs and the big contractors, in fact they are proud to have a large number of the best contractors in the city among their clientele. They always come to Muldoon's because they have discovered that Muldoon's service is not just an empty byword. This class of customer the firm is anxious to develop and retain and, indeed, their policy is to so satisfy all clients that they will be permanent customers.

As stated before, J. Muldoon, Ltd., handle any class of building material. In one or two commodities, however, they are specialists. For example, they have developed an immense trade in lath, Mr. Muldoon himself is an authority on lath and lathing and has built up this phase of his business to large proportions. Excellent mill connections assure customers of the very best service as far as the purchase of lath is concerned.

Another commodity on which special attention is being centered is fire brick. Muldoon's represent the Harbison-Walker Refractories Co., of the United States and are developing a strong trade in this material. Just recently they received an order for a large portion of the fire brick for the new civic incinerator.

J. Muldoon, Ltd., have supplied material to a number of large jobs in Toronto recently. These include the Farmer's Dairy Building, Robt. Simpson Co.'s addition, the Trinity College, Reception Hospital, Jarvis St. Collegiate, a number of schools, Hillcrest car shops, the Toronto Transportation Commission's work, the City Works Department, and a number of paving jobs.

Oil Burner Manufacturers Form Association

The American Association of Oil Burner Manufacturers, an organization of both home and industrial oil burner manufacturers, was recently formed in Chicago, Ill. Broadcasting accurate data concerning oil burning and the oil burner industry is one of the association's principal aims. Wallace C. Capen, Home Appliance Corporation, St. Louis, Mo., was elected president, and Leod D. Becker, editor of Fuel Oil for Heat and Power, Galesburg, Ill., was made acting secretary. Temporary headquarters will be maintained at 518 Bank of Galesburg Building, Galesburg, Illinois, and Room 605, 20 E. Jackson Blvd., Chicago. The association will gladly answer inquiries from interested individuals or firms concerning all kinds of oil burning.

Wood Pulp Wastes Spoil Water Supplies

Water supplies in a number of localities are reported as having trouble with wastes incident to manufacture of woodpulp. The wood fibre itself has caused some trouble, but the greatest damage done to the stream by mills of this character is due to the discharge of waste sulphite liquor which imparts a very high color, difficult to remove, even when greatly diluted. The presence of these wastes retard coagulation, call for a greatly increased dose of coagulant and of chlorine required to sterilize. Aeration after coagulation and sedimentation has been of value, in at least one instance, in treatment of a water supply contaminated with sulphite waste. Disagreeable tastes and odors are caused by sulphite wastes, if present in appreciable quantities.

l teams provide reliable service whether orders are large or small

English Practice in Sanitary Matters

A Review of the Present Day Status of Sewage Treatment and Disposal—Sanitation in Residences — Concrete in Sewers — Activated Sludge Developments

By H. C. H. SHENTON*

Very few people appreciate the wide scope of sanitary engineering. Such matters as drainage and the supply of pure water are accepted as if they were natural normal conditions similar to daylight and fresh air. There is, however, nothing normal about them, and if it were not for the unceasing work of the engineer life in our large cities would be impossible.

If one follows the course of a drop of water from the time when it is extracted from the river Thames for the London water supply to the time when it again enters the river at Barking or Crossness from the outfall sewer, some idea of the engineer's work may be obtained. It is drawn from a river which receives the drainage of all the Thames Valley above; the sewage of such Towns as Oxford and Reading, together with that of innumerable smaller places, houses, factories, etc., enters the Thames above the intake of the Metropolitan Water Board; yet such is the excellence of the work of the sanitary engineer that the water at the intake is practically as good in quality as if it were drawn from the river 55 miles higher up. Sir Alexander Houston has shown this. The water is purified by storage, it is filtered, sterilized and pumped, it flows into a system of 6,577 miles of water main, and is eventually delivered for the supply of a house or other building. Let it be remembered that every house in London must not only be connected to the sewers, but that it must contain a number of sanitary fittings soil pipes, waste pipes and rain-water pipes, and it must also possess an elaborate system of drains.

Responsibility of the Sanitary Engineer

The extent and importance of this branch of sanitary engineering is very great, seeing that it extends into every house in the community and that failure is attended with danger to health. The water having passed through pipes, cisterns and sanitary fittings, flows through the drain to the sewer; house sanitation is in itself a great subject.

Next consider the magnitude of the system of sewers which extends into every street; branch sewers run to main sewers and these again into trunk sewers. Construction varies from the laying of a 6-in. pipe to the building of large tunnels through which rivers of water flow, sometimes it will be a brickwork, concrete or masonry tunnel, and sometimes a cast-iron tube similar to the electric railway tunnels. All these sewers must be laid at such levels that sewage containing solid matter may flow along freely, all must be easily accessible for cleaning by means of innumerable manholes, all must be efficiently ventilated. Then again, the sewers must be sound, they must be capable of taking off the enormous quantity of water due to rainfall. There must be no danger of failure from external crushing owing to the large loads which modern traffic brings upon them. The whole of the sewage has to be lifted by pumps. The sludge must be settled out of it before it reaches the river and the sludge must be collected and carried out to sea in barges. In the meanwhile, experimental work is always going forward, which has for its object the purification of this vast quantity of sewage to a much higher degree than is at present practicable.

Turning now to another side of the question, take the case of one of our great liners which carries the population of a small town. The problem of dealing with the sewage of a great ship is in itself a very large and serious matter. A sewer on land does not move, but on board a ship practically anything may happen as far as gradient and level are concerned. The problem of dealing with this sewage has to be very carefully considered, and great skill is exercised in the matter. For instance, in the case of the White Star liner "Britannic" eighteen stereophagus pumps were used. A land scheme of drainage which required eighteen centrifugal pumps would be one of some magnitude.

Another section of our work is the construction of outfall sewers sometimes carried far out to sea. Great and remarkable works exist. With regard to this matter, it is of interest to note the manner in which reinforced concrete is being used for such work. Large inverted syphons carry sewage under rivers and docks. Here also it is notable that reinforced concrete tubes are being used.

Sewage Disposal

Not the least interesting and important branch of the work of the sanitary engineer is the purification of sewage. This problem is enormous. It ranges from purification of the sewage of the largest cities, sometimes containing a very large proportion of trade wastes, rendering treatment exceedingly difficult, to the purification of the sewage coming from a small isolated house. It may be necessary to purify the sewage almost to a drinking water standard, or on the other hand, where advantage can be taken of dilution and natural purification in a river, it is necessary to give only the exact degree of purification required.

In this respect insufficient attention has at present been paid to the advice given by the Royal Commission of Sewage Disposal, which is as follows:—

"In view of the importance of not requiring a local authority to incur any further expenditure on sewage disposal than the circumstances of its area require, we feel strongly that the law should be altered so as to allow local circumstances to be taken into account." "Local authorities should not be required to purify their sewage more highly than is necessary to obviate the risk of actual nuisance."

In the Health Ministry's annual report it is stated that a general understanding has now been arrived at between that department and the Port of London Authority as to the degree of purification for effluents discharged into the various parts of the river, the degree of purification in the upper reaches being necessarily higher than in the lower reaches.

The purification and treatment of trade wastes in itself is a very large subject. There are innumerable smaller but no less difficult problems presented by villages, houses, hospitals and institutions. In some cases it may even be necessary to sterilize the effluent, for the engineer has not only to purify the sewage, but to do so in such a manner that there may be no danger of pollution to the underground water supply. It is also the duty of the engineer to find means whereby sludge may not only be purified, but may be utilized, for it is admitted that enormous waste occurs at the present time, and many workers are giving great attention to the matter.

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*President of the Institution of Sanitary Engineers at a recent meeting of the Institution

House Sanitation

One of the matters most worthy of consideration at the present time is the difference which exists in the practice of English and American engineers. In this country we have for a long time past adopted the principle that all soil pipes shall be kept distinct from bath, sink and lavatory waste pipes. The Americans, on the other hand, appear to use one system of pipes for all purposes. It is obvious that the American system is much more economical than our own, because it saves a double system of pipes, and many branch drains, gullies and manholes otherwise required. If a bath, sink or lavatory basin is trapped suitably, and if the pipes are ventilated, so that syphonage and air pressure are impossible, it seems that the American engineer sees no objection to the waste pipe being connected direct to the drain or soil pipe. Where this is done there is a saving, first of a separate waste pipe, or system of waste pipes, next of the gulley or gullies into which such waste pipes discharge, next of the branch drains running from the gullies to manholes, and lastly of the manholes themselves, in short about half the expense of the work is saved. Seeing that this applies to every house built and that the present need for economy is great, the matter is at any rate worthy of our consideration. One may reasonably ask whether there is any great difference between a slop sink with a 3-in. trap connected to a soil pipe, which is a matter of common practice, and a bath or sink pipe, with, say, a 2-in. trap connected to a soil pipe which is absolutely against all ordinary rules.

It must not be imagined that the interior of a sink waste pipe is cleaner, or less likely to smell, than the interior of a well-kept drain or soil pipe.

The author was recently informed that the drains of the London County Hall are all above the basement-floor level. There can be no doubt that the practice of keeping drain pipes above ground level where possible—and it often is possible—is to be commended, seeing that the pipes are then accessible for inspection, and any leakage will at once be apparent. Much excavation and other work is saved, small hatch boxes take the place of expensive manholes, and one can tell almost at a glance whether the system is right or not. By the arrangement of sanitary fittings at suitable levels it is sometimes possible to effect a large saving by keeping pipes above ground. Needless to say these are iron pipes.

Although it is generally admitted that the intercepting trap would be unnecessary in connection with a perfect sewage system, it does not appear that the average system of sewers in this country is perfect enough to encourage engineers to use the house-vent pipes as sewer ventilators. However, cases exist where the interceptor has been omitted wholesale, apparently with satisfactory results, and it seems as if the matter deserved more attention that it has recently received.

Sewers

Recent work shows the increasing use of the concrete pipe and the reinforced concrete pipe. Plain concrete and reinforced concrete sewers built **in situ** are also much in evidence. It may be said that the stoneware pipe is generally only used for sewers of small diameter.

Recently the author has observed the failure of pipes of large and also a comparatively small diameter laid in different places under different conditions owing to lack of support against vertical crushing. Reference to recorded results of tests or simple calculation will show that a given pipe can only take a certain load on the top; where, owing to the weight of earth filling, this figure is exceeded crushing results. Such investigation will show that concrete bedding and haunching are required in many cases where they are omitted. It appears that the need for considering the load coming upon the pipes and their strength to resist is not always grasped by those who lay them. The work of sewer construction is an engineering matter, and it is very false economy to allow anyone but an experienced sanitary engineer to deal with it.

The concrete tube manhole is extensively used owing to the saving of brickwork and labour thereby effected, and also owing to the soundness of its construction, particularly in wet ground where tne exclusion of land water is essential. The reinforced concrete manhole cover is on the market, but does not appear to have been used up to the present time.

In the author's opinion, insufficient attention is given to the probability of expansion and contraction in concrete pipe lines. The extreme rigidity of the ordinary joints is certainly a drawback, seeing that any movement or settlement tends to cause fracture. The Stanton Hume pipe is made with a double socket, into which cement or lead can be caulked. The lead joint no doubt possesses the advantage of slight flexibility. Recently these pipes have been made with ordinary sockets. Some years ago the author used the Brandram joint, which consisted of a steel band drawn round the pipe and keyed, while it was covered with hot bitumen. Recently the joint which appears to be somewhat of the same character has been brought forward. It is difficult to understand why joints of this type are not used more frequently with concrete pipes, seeing that they would not be affected by movement and would, in fact, have some flexibility. The Victaulic joint has, of course, been used largely for iron and steel pipes. It has been approved by Lloyds for use on ships, and it is also interesting to note that it has been used on a 15-in. cast iron sewer at Dartford, and on a 3-in. steel sewage main at Bradford. The application of this valuable flexible joint to concrete and reinforced concrete pipes is desirable, but apparently this is still a thing of the future. The cast-iron pipe lined with cement by the centrifugal process is also worthy of note in connection with sewerage work.

Activated Sludge Process

It is customary in speaking of sewage disposal to consider the largest works, and to draw conclusions from them, which do not necessarily apply to the much greater number of smaller works, which, considered collectively, are of equal importance. At such places as Manchester, or Sheffield, problems have to be faced which do not occur at the majority of works.

There are many places where the disposal works have been more or less surrounded by houses. Extension under such circumstances is very difficult, the load thrown upon the works is continuously increasing, while the need for a perfect effluent and an entire absence of smell become more and more imperative. Such instances are not uncommon round London. The policy of making one large outfall sewer to serve a whole valley and to gather the sewage of many places on its course has been adopted in some cases,, but there are generally various difficulties which prevent the speedy adoption of such schemes.

The activated sludge process in one form or another is likely to be the solution of such difficulties. It is receiving an increased amount of attention on the part of those local authorities who are faced with the necessity of extending inadequate works. The Ministry of Health in their last annual report mentioned ten schemes of activated sludge treatment for which loans have been sanctioned. Some of these being for one process and some for another. It is clear that the Ministry have an open mind on the subject, and given full consideration to schemes prepared upon the Manchester, Sheffield or Bury systems.

Practically speaking, any required degree of purification can be obtained by means of the activated sludge process without nuisance, upon very small area. A few relatively small tanks with required machinery will purify an immense volume. The amount of treatment required must always depend upon a number of conditions which vary in every case. It may be desirable to give partial treatment, or absolutely complete treatment. It may be practically economical or necessary to remove a proportion of the sludge by preliminary treatment, but it certainly appears that the complete treatment of the whole of the sewage and the whole of the sludge can be effected where sufficient aeration is given. It is merely a matter of expense.

Dewatering

The dewatering of the activated sludge discharged from the tanks has received a great deal of attention, chiefly with the object of producing a fertilizer in a portable form. These experiments have indicated the varying nature of the sludge produced at different places owing to variations in the quality of the sewage. The author would suggest that rather too much is made of the difficulty of dewatering activated sludge in ordinary working. As far as his experience goes the difficulty of reducing the water content is overcome at works of importance by running the sludge on to a simple ash filter, on which the sludge dries to such a degree within a few hours that it can be picked up in thin slabs, large cracks appearing all over the sludge bed.

The use of activated sludge as a fertilizer when it is applied to the land is evident. Good results have been obtained, and Mr. J. A. Coombs, in the discussion which followed the reading of his paper before this institution, said: "The first big town which pumps activated sludge over a sufficient area of distribution will be pioneers of a practice which will be copied everywhere." The problem of drying this material completely for use as a fertilizer will probably be solved in the near future. There are various possibilities. Doctor Hele Shaw's streamline filter is capable of dewatering activated sludge completely at a very moderate pressure, and is certainly a very important factor in the case. Activated sludge has been referred to by Doctor Nasmith as if it were of a highly putrescible character. In the author's experience it does not differ greatly from ordinary humus derived from filters, but no doubt there are various degrees of quality at different works.

Mr. J. D. Watson, of Birmingham, Mr. A. J. Martin, and others have shown that it is possible to utilize the sludge from ordinary digestion tanks profitably. Some of our large towns, like Bradford, Huddersfield and Morley, extract grease from sludge and sell it; elsewhere, as at Kingston-on-Thames, artificial manure is produced. We have the word of Mr. Watson that utilization of sludge is a duty, and there can be no doubt about it, because Mr. Watson has dealt with the problem on a very large scale at Birmingham, and speaks with knowledge.

Mr. Martin recently, in a most valuable paper read at the Hull congress of the Royal Sanitary Institute, gave certain instances which should be noted. Sludge mixed with coal dust has provided a valuable supplementary fuel for boilers at Birmingham. The gas produced has driven a 30-h.p. engine. Elsewhere sewage has been pumped by engines run with gas from septic tanks, and the gas has also been used for lighting and for cooking purposes. Mr. Martin showed that there are great possibilities for the utilization of the sludge without losing the manurial properties of the digested sludge. He further suggested that this gas might be used for providing a public hot-water supply for houses.

Mr. Willis, of Chiswick, has found that by mixing sludge with destructor clinker a very hard concrete-like substance is produced which can be used for roadmaking, and he has urged the importance of this discovery on more than one occasion.

Building Permits for September

The value of the building permits issued showed a slight decline during September as compared with August and there was also a small decrease as compared with September of last year. According to reports from 56 cities the estimated cost of building work during September was $10,485,613, while in August it stood at $11,541,593 and in September, 1922. at $11,424,119. There was, therefore, a reduction of $1,055,980 or 9.1 per cent in the former and of $938,506 or 8.2 per cent in the latter comparison.

Forty-seven cities furnished detailed statements showing that they had issued nearly 1,200 permits for dwellings at a proposed cost of approximately $5,000,000. Some 2,900 permits were issued for other buildings at an estimated valuation of over $4,800,000. As has been mentioned in previous press letters, the construction of several buildings is frequently authorized by a single permit; the number of buildings to be erected, therefore, would be larger than appears from the number of permits issued.

Nova Scotia, New Brunswick, Quebec and Alberta showed increases in the value of the permits issued as compared with August, 1923. The largest actual gain of $882,752 or 35.3 per cent was recorded in Quebec, while Nova Scotia with a gain of $75,630 or 275.8 per cent, registered the most pronounced proportional increase. Of the declines reported in the remaining provinces, those of $1,437,093 or 55.1 per cent in British Columbia and of $720,943 or 13.3 per cent in Ontario were most noteworthy.

In comparison with the returns for September, 1922, Quebec, Alberta and British Columbia registered increases in prospective building. Quebec, with a gain of $444,507 or 15.1 per cent, showed the greatest increase. The heaviest loss, of $801,581 or 14.6 per cent, occurred in Ontario, but that in Manitoba of $324,115 or 38.2 per cent was also pronounced.

An analysis of the returns from individual cities shows that in Montreal the value of the building permits issued during September exceeded that for August, 1923, and also for September of last year. In Toronto there were reductions in both comparisons, Winnipeg registered a rather larger total of anticipated building than in the preceding month, with a decline as compared with September, 1922, while in Vancouver there was a decrease in comparison with the August figures, but an increase over September of last year. Quebec, Three Rivers, Brantford, Fort William, Hamilton, Kitchener, London, Niagara Falls, Port Arthur Brandon, Edmonton and South Vancouver registered increases in the estimated cost of building in both comparisons.

The value of the building permits issued during the first nine months of this year showed a decline of 8 per cent as compared with the corresponding period of 1922, and an increase of 21 per cent over the first nine months of 1921. The total for 1923 was $105,265,554; for 1922; $115,113,336 and for 1921 $86,970,449.

Easier Prices on Sand and Gravel in Winnipeg

Winnipeg, Oct. 13—Building in Winnipeg this month is not very active. The demand for materials is small and there are no large stocks being carried. Prices still remain fairly firm with the exception of sand and gravel. On these commodities reductions have been made, mainly on account of over supply and small demand.

The situation as far as we can see is that there will be very few new buildings started this fall, and once the buildings under construction are completed the season's work will be over except for repair work and alterations.

New Books

Electrical Methods of Handling Materials

"The Electrical Handling of Materials" by H. H. Broughton, is a four-volume series of books, dealing with the design, construction and application of cranes, conveyors, hoists and elevators. The fourth volume has just been published, it dealing specifically with the machinery used for the mechanical handling of materials and the methods of handling and storing materials. The 323 large-size pages of text contain very detailed descriptions of machinery and methods which are further explained by photographs and drawings, of which a large number are included. The chapter headings, which give a good indication of the scope of the book, are as follows; Elevators and conveyors; belt conveyors; automatic feeders, handling materials automatically with skip hoists; lessons for America in the bulk-handling of materials; handling and storing of grain; suctions system of discharging grain; handling and storing of coal, ore and similar bulk materials; belt shipping plants; Panama Canal coaling stations; handling of foodstuffs and general merchandise. The book is published by Messrs. Benn Bros., Ltd., London, E. C. 4, and sells at 50s. net.

Trade Publications

Sauerman Power Scrapers

A 32-page booklet, descriptive of Sauerman Power drag scrapers and Sauerman portable scraper outfits has been issued by Sauerman Bros., Chicago, Ill. This new pamphlet contains thorough and useful information on the design and construction of this popular type of equipment and illustrates quite comprehensively the many ways of adapting power scrapers to the conditions and requirements of various excavating and material handling propositions. It not only shows a diversity of applications of Sauerman scrapers in connection with sand and gravel plants but also illustrates valuable ideas that have been carried out in adapting the equipment to many difficult and unusual jobs. F. H. Hopkins & Co. Ltd., Montreal and Toronto, are Canadian agents.

Osgood Heavy Duty Steam Shovel

The Osgood Company, Marion, Ohio, are distributing a four-page bulletin, describing and illustrating the Ohio 1¼-yd. heavy duty steam shovel, which has been designed to handle heavy work without sacrificing speed, simplicity or ease of operation. The machine can be equipped for high dumping or for digging trenches and is especially adapted for dragline work or clamshell, or for use as a crane.

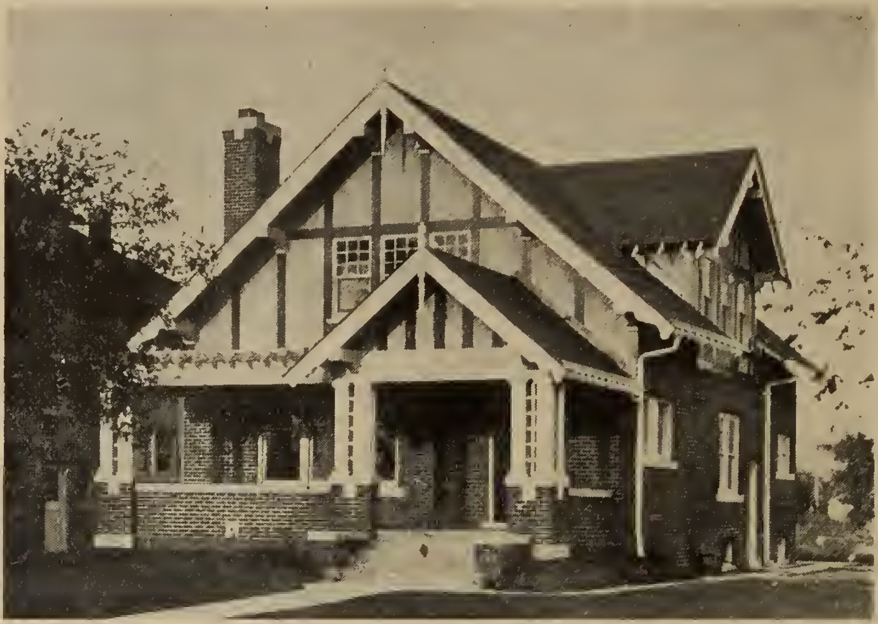
Cold Repair Cement for Roads

The Barber Asphalt Paving Co., Philadelphia, Pa., have issued a 16-page booklet entitled "Barber Brand Cold Repair Cement," which describes the uses of this material for repairing roads and constructing grade crossings and station platforms. Full instructions governing its application are included.

Bucyrus Gasoline Shovel

Bucyrus Company, South Milwaukee, Wis., have issued bulletin F-20, describing their 20-B ¾-yd. universal shovel. This machine, as the name "universal" implies, may be had either as a shovel or as a dragline excavator, clamshell excavator or crane. As is the case with other Bucyrus universal shovels, the change from one equipment to the other may be made readily and quickly in the field. The construction and operating features of the shovel are fully described in the bulletin, which includes a list of the working dimensions and specifications. Bucyrus shovels are handled in Canada by Mussens, Limited, and the Dominion Equipment & Supply Company.

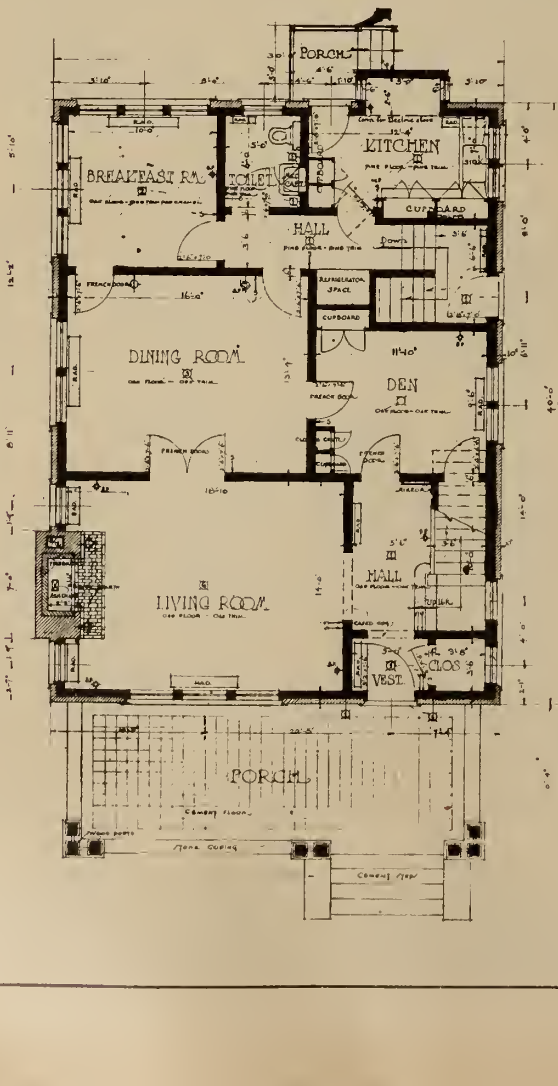
Sociedad De Aguas Alicante, Apartado 140, Alicante, Spain, wish to be placed in communication with manufacturers of water meters, and solicit catalogs, price lists, etc.

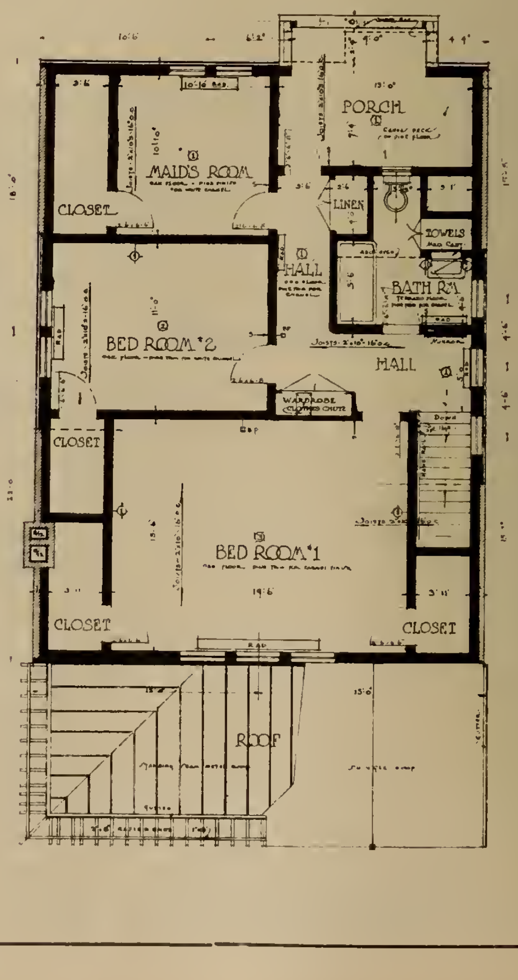


The Contract Record's Weekly House Suggestion No. 86

This fine brick and stucco home was designed by Mr. Gilbert J. P. Jacques, architect, 3 Ouellette Ave., Windsor and built at Park Place, Sandwich, for A. Nestman. The plans shown are so complete in descriptive detail as to require little explanation. The rooms are well located with relation to one another and the cross hall at the rear provides the very desirable feature of kitchen isolation from the living quarters. The many windows on both sides of the breakfast room at the rear give a bright, cheery atmosphere to this room. The den or library is a very desirable room where there is sufficient space to allow for it. It fits in very nicely in this plan, being accessible from the dining room and front hall through handsome French doors.

The upstairs arrangement is also well planned. The feature of the layout here is the large main bedroom.





Mainly Constructional

East and West—From Coast to Coast

Seven provinces were represented at a banquet of Good Roads officials held recently at the Chateau Frontenac, Quebec. Premier Taschereau of Quebec addressed the gathering and urged co-operation between the provinces, not only in the matter of road construction, but in policy also.

An announcement made during the recent annual assembly of the Royal Architectural Institute, at the Windsor Hotel, Montreal, was that the Royal Canadian Academy has created a $1,500 scholarship in architecture.

Montreal may soon be given a new hotel if a syndicate interested in the affair carries out its plans. The property of Major George Washngton Stephens located on Dorchester street here, is said to have been purchased by a Quebec man at a cost of $1,000,000, and a syndicate is to take it over to erect an 800-room hotel, costing $6,000,000.

Council at Sandwich, Ont., has approved of the proposed sanitary storm sewer system, at a cost of $43,000 and tenders are to be called in time for the next meeting of the council, as work will be rushed.

It was decided at the recent meeting of the Royal Architectural Institute at Montreal, to hold the next annual assembly at Hamilton.

A report from Winnipeg States that erection of the first pulp and paper plant in the prairie provinces at a cost of $3,000,000 has begun near that city. The plant will have an initial capacity of 120 tons of newsprint a day and will, it is believed, furnish paper to the middle-western market of the United States.

The West Lake Brick & Product Company, Limited, West Lake, Ont., have engaged the services of Mr. J. G. Shepard of Peterborough to take charge of the reorganizing of this company's business. The Company intends to build a new plant at Wellington, and as soon as the new building is completed, the equipment at West Lake will be removed to Wellington. The maximum capacity of the new plant will be forty thousand brick per day.

The new Government drydock at St. John, N. B., is to be officially opened on Monday, October 29. The opening ceremony will be performed by his Excellency the Governor-General, and Hon. Dr. King, Minister of Public Works, will attend.

York Township Council recently received a communication from the Toronto Police Board, agreeing to reciprocal relations regarding licenses for electrical contractors and journeymen. The matter was brought before York Township some time ago, when a deputation of electrical contractors claimed that the city by-laws would not permit them to take work in the city because of non-residence, while the township allowed city workmen to do business. A relationship similar to that passed for the plumbing trade was desired.

The calling for tenders on proposed city hall at London, Ont., has been held up. The decision arrived at by the council at a recent meeting was to submit to the people, at the December elections, a by-law to raise $500,000 towards the cost of constructing this building, although Mayor Wenige claimed that $400,000 was available at the present time towards this cost, leaving only $200,000 to be voted by the people. This claim went unheeded however.

Messrs. Webster & Trory, Galt, Ont., have been awarded the contract for the erection of a bridge over the Speed River, on King St., Preston, Ont., at a cost of $60,716. The old structure will most likely be wrecked. The Grand River Railway will bear a portion of the cost of this new structure and it is expected that the Department of Highways will also help in the financing.

Over one hundred men are at work on the construction of the new docks of the Ford Motor Company of Canada, at Ford City. Concrete for the 100 foot width of the dock, starting at the west end, is already being poured and new concrete abutments further east are being rapidly placed in position. At the present rate of progress the docks should be completed by the first of the year, when construction on adjacent works to be situated between the docks and Sandwich street will be started.

The Dominion Railway Board recently investigated the cost of installing equipment at the five Toronto round houses of the C. P. R. and G. T. R. for the abolition of the smoke nuisance and submitted a report to Property Commissioner Chisholm. Commissioner Chisholm heartily endorsed the installation of this equipment, stating the cost could not be compared to the loss occasioned by smoke to private property in the districts of these roundhouses. The equipment proposed was of the type used at the Elmsden plant, just outside Chicago, and would cost from $30,000 in the case of the Lambton roundhouse, to $74,000 for the West Toronto roundhouse of the C. P. R.

The general contract for the construction of large cold storage plant for the Quebec Harbor Commission, to be located on Dalhousie St., Quebec, has been let to T. E. Rousseau, Limited, of that city. This contract includes the electric wiring, elevators and sprinkling system. The Linde Canadian Refrigerating Co., of Montreal, secured the contract for the machinery, piping and insulation. The main building will be a six-storey concrete structure and will contain 500,000 cu. ft. of refrigerating and storage space. The power plant and fish storage plant will be located nearby.

Personal

Mr. Charles Winters, of Ottawa, has been appointed resident architect of the Dominion Public Works Department, at Toronto. This is a new position, but the appointment was actually made to fill the vacancy created by the superannuation of Mr. Thomas Hastings, clerk of works, who had supervision over all Dominion Government buildings in Toronto.

Mr. C. Miles Burpee, of Edmunston, N. B., one of the engineers on the staff of the New Brunswick Department of Public Works, has been appointed instructor in draughting and allied subjects at Marquette Universtiy, Milwaukee. Mr. Burpee graduated from the University of New Brunswick with the degree B. Sc. in civil engineering.

Obituary

Mr. Robert M. Kerr, President of the Kerr Engine Co. Ltd., Walkerville, Ont., died suddenly at his home in Walkerville recently. Mr. Kerr was born at Leidburn, Scotland, on July 6, 1842, coming to Canada at the age of 23 and working for several years as a machinest in various parts of the country. He later entered the foundry and machine shop business with his brother, William Kerr, at Sandwich, under the firm name of Kerr Brothers, the company being incorporated as The Kerr Engine Company, Limited in 1890 manufacturing marine and stationary engines, pumping machinery, valves and hydrants. Mr. Kerr was actively engaged in this business up until a few days before his decease. He was an ex-Mayor of the town of Walkerville and had a wide business acquaintanceship throughout Canada.

Trade Incorporations

Industrial Contracting & Sales Co. Ltd., with head office at Montreal, capital $100,000, to carry on a contracting and building supply business.

CONSTRUCTIONAL ACTIVITY

Period of October 17 to October 23, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Craven, Sask.
Tenders will be received by the secretary, R. C. Desrochers, till November 2 for the construction of a stone and timber dam across the Qu'Appelle River at Craven. Plans at District Engineer's office, Winnipeg.

Portage La Prairie, Man.
Tenders will be received till October 31, by the Department of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for the construction of an 18 inch outfall sewer of cast iron pipe with manholes, valves special castings, etc. Plans at office of district engineer, Winnipeg, and post office, Portage La Prairie.

CONTRACTS AWARDED

Campbellton, N. B.
The general contract for building dam in connection with water works, dam and pipe line to cost $70,000, has been awarded by the town council to J. C. Chatterton, Campbellton. 20 in. wood stave pipe 1¼ miles long has been purchased 15 ft. wide at botton, 3 ft. wide at top, 35 ft. long at top.

Herbertville, Que.
The contract for gravelling road has been awarded to Isidore Duquette, Lac Megantic, at $9,002.

Metis Lake, Que.
La Commission des Eaux Courantes de Quebec, Montreal, Que., have awarded the contract for reservoir dam here, to Newton-Dakin Construction Co. Ltd., Sherbrooke, Que.

North York Twp., Ont.
The township council has awarded the contract for sidewalk on Snowden Ave., to Canadian Construction Co., Toronto. Engineers are James, Proctor & Redfern, Toronto.

Ottawa, Ont.
The contract for new 110 ft. water tower with capacity of 500,000 imperial gallons has been awarded to Dominion Bridge Co., Montreal, Que.

The city council has awarded the contract for 1,150 ft. of reinforced 30 in. concrete pipe to Dominion Lock Joint Pipe Co. Ltd., Hamilton, Ont.

Port Credit, Ont.
The following contracts have been awarded by the town council on $30,000 addition to waterworks system 4 in. & 6 in. C. I. pipe $12,9711 National Iron Corporation Ltd., ft. of Cherry Sa., Toronto. special cast--ings $575—Dominion Wheel & Foundries Ltd., 131 Eastern Ave., Toronto; 6 in. & 4 in. valves $411—T. McAvity & Sons Ltd., 13 King St., St. John, N. B.; Laying 6 in. & 4 in. mains $7,019—Andrew Fisher, 79 Seventh St., Niagara Falls. Engineers are Gore, Nasmith & Storrie, Toronto.

Port Dalhousie, Ont.
The town council has awarded contract for sewers on various streets to Thos. Riley, 106 King St., St. Catharines, at $5,000.

Quebec, Que.
The contract for gravelling roads, St. Bruno-Roberval-St. Bruno Route (Normandin Twp.) has been awarded to Isidore Duquette, Lac Megantic, at $9,663.-20, and Co. Lac St. Jean, at $19,195.48.

Richmond, Que.
Cairnie Construction Co, Montreal, have the general contract for gravelling roads on Richmond-Yamaske route, at $32,350.

St. Etienne de Beaumont, Que.
J. B. Belanger, Montmagny, has been awarded the contract for gravelling road at $12,393.15.

St. Malachie D' Ormstown, Que.
The contract for refection of macadam road has been awarded to O'Connor Bros., Huntington, at $6,885.70

Three Rivers, Que.
The city council has awarded the contract for macadam pavements, to Bourassa & Clifford, St. Antoine St., at $25,000.

The city council has awarded the contract for approximately 4 miles of bituminous macadam pavement to Bourassa & Clifford, St. Antoine St., at $54,089. Chas. Gelinas is the engineer.

The city council has awarded Bourassa & Clifford, St. Antoine St., the contract for concrete pavement on Ste. Marguerite St., city limits to St. Denis St., at $66,500.

York Twp., Ont.
The following contracts have been awarded for watermains: Kodak & Trenton $1,300 Twp. Engr.; Larkin, Armadale & Lockhart $900, Ontario Foundation Co. Ltd., 22 Watford Ave.; Ridelle $1,000 Murphy Contracting Co., 8 Wychwood Ave. All of Toronto. Engineer, F. B. Goedike, 40 Jarvis St., Toronto.

Contracts for sidewalks have been awarded by the township council as follows; Gamble Ave. $3,200, Thyra $1,600, Inwood $1,500—Murphy Contracting Co., 8 Wychwood Ave.; Lesmount Ave. $1,-900—A. McAdam, 45 Jarvis St.; Barker $1,200—S. Simpson, 227 Wychwood Ave; Brummell $1,000, Greenwood Ave. $900 —Grant Contracting Co. Ltd., 50 Front E;Castelton Ave. $1,200 W. S. Nairn Ave. $2,000—Jno. Harrop, 1414 Davenport Rd.; Coxwell Ave $1,500—Ramsay Contracting Co., 39 Indian Cres.; Dunraven Dr. $1,700, Nairn Ave. $1,600—Lounsbury & Hough, Crown Office Bldg.; Wilie $1.400, Everett & Hamstead $4.400 Greenwood Ave. $1,100—D. C. Kay, 287 Ashdale Ave.; Gatwick $2,700, King Edward $2,600, Wellington $4,500— H. S. Walton, Gamble Ave.; Bolton $1,400 —National Contracting Co., 9 Garnock Ave. All of Toronto. Engineer—F. B. Goedike, 40 Jarvis St.

The township council has awarded the following contracts for paving; Constructing & Paving Co. Ltd., Confederation Life Bldg, $3,300; Godson Contracting Co. Ltd., Manning Chambers, $6,700. Warran Bituminous Paving Co. of Ontario Ltd., 54 University Ave., $8,200. All of Toronto. Engineer, F. G. Goedike, 40 Jarvis St., Toronto.

Railroads, Bridges and Wharves

North River, N. S.
Dept. of Public Highways contemplate building a bridge here, to replace steel bridge recently destroyed by flood. W. A. Henry, Halifax, is the engineer in charge.

Province of Quebec.
Tenders are being received by the deputy minister. J. L. Boulanger. Parliament Buildings Quebec, till November 8 for construction of a concrete bridge over the Red Creek. on Montreal-Sherbrooke Highway, in the municipality of Petit Lac Magog, and for construction of concrete bridge over Petit Pre Casault and Lemoine Rivers. on Quebec-St. Simeon Highway in the parish of Chatean Richer.

St. Prosper, Que.
New tenders are being received till November 5th by the Watford West Twp. Council through the secretary-treasurer, Norbert Samson, for the erection of an iron bridge.

Sherbrooke, Que.
The city council and Canadian Pacific Rly., are having plans prepared for a $25,000 viaduct on Galt St.

Vancouver Island, B. C.
Canadian Pudget Sound Lumber Co., Victoria, B. C., propose to construct 30 miles of logging railway from Sooke Harbor through Jordon River into Port Renfrew district.

CONTRACTS AWARDED

Harrop, B. C.
Geo. H. Hope, Nelson. B. C., has the general contract for building $7,150 floating wharf here.

Preston, Ont.
The town council has awarded the general contract for bridge over Speed River, to Webster & Trory, Galt, Ont., at $60,716. Abutments will be started at once; other work to be done next summer.

Public Buildings, Churches and Schools

Fort William, Ont.
Tenders will be received by the district engineer, F. Y. Harcourt, Customs Bldg., Fort William, till October 27 for

alterations in the Customs building to provide quarters for a caretaker.

Hamilton, Ont.

The city council contemplate building a fire station corner Dunsmore Rd. and Spadina Ave., and another one on Charlton Ave. between Locke and Dundurn.

Hull, Que.

Plans for $30,000 church for Zion Presbyterian Church are being revised and new tenders will be called. J. MacLaren, 104 Sparks St., Ottawa, Ont., is the architect.

London, Ont.

Pennington & Boyde, Windsor, Ont., are preparing plans for a $500,000 seminary owned by St. Peters Seminary, Dufferin Ave.

Long Branch, Ont.

Bulk and separate tenders are being received till October 26 by the clerk, A. Barrarr, Islington, Ont., for the erection of a fire station. Plans and specifications at office of township engineer, Islington, and at Post Office, Long Branch.

Montreal, Que.

Church of God & the Saints of Christ contemplate building a church on Osborn park. A home for widows and orphans is also part of the project.

O'Brien Twp., Ont.

The Roman Catholic Separate School Board contemplate building a $35,000 school here.

Ottawa, Ont.

Tenders are being received till November 7 by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont. for $150,000 addition to Archives building. Plans and specifications at offices of chief architect, Dept. of Public Works, Ottawa, resident architect, Dept. of Public Works, General Post Office Toronto, and assistant mechanical engineer, Dept. of Public Works. Dom. Public Works Bldg, Montreal, Que.

Tenders are being received by the Dept. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for construction of botanical laboratory (Central Experimental Farm). Plans and specifications at offices of chief architect, Ottawa, Ont.

Quesnel. B. C.

Wm. Frederick Gardiner, 701 Vancouver Block. Vancouver. is preparing plans for $12.000 church for St. John the Devine congregation.

St. Lambert, Que.

Tenders are being received by the town council, through the secretary, J. R. Beatty, till October 29th, for erection of fire and police station. Plans and specifications with engineer, 1. Kellett. A 10% accepted cheque required.

St. Williams, Ont.

The village council contemplate the erection of a library. By-law will be submitted to the ratepayers on October 29th.

Simcoe, Ont.

The Board of Education contemplates building a $40,000 addition to school on Wilson Ave.

Tillsonburg, Ont.

.The town council contemplate building a hospital, and want prices and suggestions for building of hospital and information on hospital equipment.

CONTRACTS AWARDED

Almaville, Que.

The foundations are in for $60,000 R. C. church. Masonry—Gedeon Leblanc, Shawinigan Falls. Architect, Jules Caron, 21 St. Joseph St.. Three Rivers Que. Tenders are being received by the architect on roofing, plumbing and heating. No closing date set.

Brampton, Ont.

General contract for $40,000 sunday school for Grace Methodist Church, has been awarded to Horton & Smith, Hamilton. Architects, Horwood & White, 229 Yonge St., Toronto.

Cornwall, Ont.

General contract for school has been awarded to Belanger & Papineau, Cornwall, at $52,000, which includes heating and plumbing. School will be of concrete and solid brick, with steam heating system.

Guelph, Ont.

The city council has awarded the following contracts in connection with grand stand to be built: steelwork—Standard Steel Construction Co., Welland; asphalt roofing—W. A. Moffatt, Toronto. carpentry — Geo. Ibbotson; masonry—Johnston & Williams; concrete —A. J. Hatch; plumbing—Geo. Fairley; painting — H. E. Pass, 45 Green St. Architects — Coates & Dangerfield, 20 Douglas St.

Hamilton, Ont.

The Board of Education has awarded the following contracts on school to be built on Murray St. W.. general contract—W. H. Cooper, Clyde Bldg., at $192,127; terrazzo floors and marble work—Kent Garvin & Co., Ltd., at $2,825; ventilating, plumbing and heating—Adam Clark, 7 Main St. W., at $19,820; electric—Albert Schwenger, 18 Balmoral N., at $19,820; steel—Hamilton Bridge Works Co., Ltd.; cut stone—A. Stead. 148 Central. steel sash—Canadian Metal Window & Steel Products, Ltd., Toronto; ornamental iron—Hamilton Ornamental Iron Co ; plastering—Hannaford Bros.; roofing—Dennis & Jocelyn; glass —Pilkington Bros., Ltd., Toronto; reinforced steel, etc.—Trussed Concrete Steel Co. of Canada, Ltd.. Toronto; sewers—J. D. Armstrong, 871 Main St. E.; painting by general contractor. Whitton & Walsh, 7 Hughson St. S. are the architects.

Culley & Breay, 35 King W., have the contract for electrical work on collegiate being built on Main East near Delta. Architects, Hutton & Souter, Bank of Hamilton Bldgs. General contractors, W. H. Yates Construction Co. Ltd.

Kitchener, Ont.

The following sub-trades have been let on $100,000 alterations and additions to House of Refuge. electric—C. Smith. corner King & Scott Sts.. painting—Bindernagel Co.. ventilating and plastering—general contractor, Dunker Bros.; 2 passenger elevators and electric dumb waiter—Roelofson Elevator Works, Galt, Ont.

Levis, Que.

Jos. Blais, Mont Marie Ave., has the general contract for $30,000 convent for Revdes Sisters de la Charitie ,Deziel St.

Mabou, C. B.

The walls are going up for $115,000 county asylum. Plumbing and heating—H. W. Thorne, Fredericton, N. B.; electric—Legere & Colbeck, Moncton, N. B. Parsons-Ed Co., Ltd., Moncton, are the general contractors. J. W. MacKay, Pictou, N. S., is the architect.

Maryvale, N. S.

A. A. McDonald has the general contract for building a school here.

Mt. Dennis, Ont.

The walls are going up (2nd joist) for $20,000 church corner Weston Rd. and Sunnybrae Crescent. Following sub-trades have been let: carpentry—B. Deakin, 8 Guestville Ave.; roofing and tinsmithing—F. W. Kidd, 14 Goldwin Ave.; electric—Patterson Electric Co., Toronto; plastering, heating and plumbing to be let by architect, J. Francis Brown, King E., Toronto. Albert E. Venn, 64 Palmerston Sq., Toronto, has the general contract.

Ottawa, Ont.

The foundations are going in for $40,000 fire station corner Parkdale and Wellington Sts. Following sub-trades have been let: plumbing—Garth Co., Jackson Bldg.; heating—McKinley & Northwood, 54 Rideau St.; painting—Mr. Trepannier, St. Francis St. Electric and plastering to be let. Architects, Millson, Burgess & Hazelgrove, 185 Sparks St.

Outremont, Que.

The following sub-trades have been let on $20,000 hall being built for Outremont Presbyterian Church. roofing—Metal Shingle & Siding Co.; electric—A. M. Hayes, 1219 Green Ave.. plumbing and heating—Reid Cambridge, Care general contractors, Reid Bros., 2a Tower St.; plastering— A. Hayward, 266 Regent; painting and glazing—W. J. Large & Son. Architect is G. Rea, 285 Beaver hall hill.

Site is being cleared corner Courcelette and Maplewood for the erection of a convent for Sisters of the Holy Names of Jesus and Mary. Architects—Viau & Venne, 76 St. Gabriel St.; general contractors—Ulric Boileau, Ltee, 568 Garnier.

Quebec, Que.

Quebec Harbor Commission has awarded the general contract for refrigerator, corner Dalhousie and St. James Sts, to T. E. Rousseau, Ltd., St. Valier St.; machinery— Linde Canadian Refrigerator Co., Ltd., of Canada, Montreal.

St. Raphael, Ont.

The walls are going up for $40,000 convent owned by Parish of St Raphael. Roofing and plumbing—J. J. Breard, 1277 St. Dominique St., Montreal; electric—R. D. Deriger, care general contractor, Horace Dufresne, 44 St. Laurent. Ventilating, plastering, painting and glazing, and ornamental iron to be let. Architect, R. Gariepy, 15 St. James St., Montreal.

Selkirk, Man.

Sub-trades as follows have been let on $37,835 power house being built for Hospital for Mental Diseases; cut stone—Gillis Quarries. millwork—Radford Wright Co., Ltd: roofing and sheet metal—western Steel Products, Ltd..

plumbing and heating—Forbes & Christie; reinforced steel—Trussed Concrete Steel Co.; ornamental iron and steel—Manitoba Bridge & Iron Works. All of Winnipeg. J. McDiarmid Co., Ltd., Myrtle & Winnipeg Ave., have the general contract.

Three Rivers, Que.
The following sub-trades have been let on school being built for R. C. Commission; roofing—H. Massicotte & Freres, Ltd., Cap de la Madeleine; plastering—R Gonneville, 17 St. Denis St.; electric—P. Rochon , 21 Badeux St. Architect, Chas. Lafond, 45 Alexandre St.. general contractors, A Dube & Cie, Ltee., Bureau Bellefeuolle.

P. Rochon, 21 Badeaux St. has the contract for electric work, and R. Ganneville, 17 St. Denis, the contract for plastering in connection with $50,000 school being built on St. Louis de Gonzague. Architect, Jules Caron, St. Joseph St.

Toronto, Ont.
The following contracts have been awarded on Jarvis Collegiate: hardware—Canada Hardware Co., 53 Richmond East, at $5,067; painting and glazing—Jas. Cassey, 30 Dalhousie St., at $6,400.

John Nelson & Son, 273 Rusholme Rd have the contract for plastering of $50,000 church, corner St. Clair and Bracondale Ave. for St. Michaels and All Angels Anglican Church. Architects, Eden Smith & Son, 73 King W.. Toronto.

Business Buildings and Industrial Plants

Elsas, Ont.
The Continental Wood Products Co., contemplate erecting a pulp mill here.

Galt, Ont.
P. W. Gardiner & Son contemplate building a planing mill, sash and door factory on Harris St., estimated to cost $100,000.

Montreal, Que.
A. B. Darbyson, architect, 228 Madison, is preparing plans for $75,000 garage to be built on St. Lawrence near Mile End station, for Bramsons Auto Service, Ltd. Tenders being received by architect till November 1. Plans and specifications with architect.

Outremont, Que.
Stonework is going up on $3,000,000 office building on St. James St. owned by Insurance Exchange Corp., Ltd. Montreal. Marble and tiling to be let. Plastering, painting and glazing by general contractors, Anglin-Norcross. Ltd.. 65 Victoria St. Architect, D. J. Spence 246 Beaver Hall Hill.

St. Catharines, Ont.
Tenders are being received till November 1 by the architects, Nicholson & Macbeth, 46 Queen St. for $25,000 factory to be built for Northern Silk Mills Co Plans and specifications with architect, and MacLean Building Reports, Ltd., 245 Adelaide St. W., Toronto. Architects want prices on all building materials, especially structural steel, sash and lumber.

Toronto, Ont.
Bulk or separate tenders are being received till November 1 by the architect, B. Swartz, 336 Dundas W., in connection with $15,000 store and dental suite to be built corner Dundas and Centre Ave., for C. J. Halloran, 202 Dundas West.

Tenders are being received by the architect, B. Swartz, 336 Dundas West, till October 25 for public garage to be erected south side Bloor St., near Jane St. 1 storey, 48 x 106, brick construction, steel beams.

Tenders are being received till October 26 by the architects, Molesworth, West & Secord, 43 Victoria St., for masonry and carpentry work for superstructure of club house being rebuilt for Parkdale Canoe Club.

Separate tenders are being received by the architects, N. A. Armstrong Co., Ltd., 7 King E., Toronto, for alterations to store for confectionery and tea room to cost $25,000, at 185 Yonge St.

Tillsonburg, Ont.
Tillson Co., Ltd., are open for suggestion and prices in connection with a $15,000 steam heating system to be installed this fall. Plans and specificatins with E. V. Tillson, Tillsonburg, Ont.

CONTRACTS AWARDED

Fort William, Ont.
The contract for plumbing and heating for $85,000 store and office building on Victoria Ave., have been awarded to Superior Heating & Plumbing Co., at $7,500 Owner, James Murphy, Simpson St., Fort William. Architect, R. E. Mason, Francis Block.

Hamilton, Ont.
Pouring concrete third floor is being done on Lister Building. The following sub-trades have been let. structural steel—Hamilton Bridge Works Co, Ltd.. miscellaneous iron—McGregor & McIntyre, Ltd., Toronto; Electric— Wood Electric Co., Toronto; plumbing—W. Newell, 153 James St. S.; heating—Drake Avery Co ; plastering and architectural decorating Federal Terra Cotta Co., 101 Park Ave.. New York. glass and store fronts—Hobbs Mfg., Co., Ltd., Toronto.

The footings are in for $35,000 office and apartment building on Main St. E.. for W. J. Tillotson, 1081 Main St. E. owner and general contractor. Steel and masonry— R. A. Jones, 220 Maple Ave.; carpentry—Morris H. Coleman, 39 Park Row S. All other trades to be let by owner. No materials purchased except brick. Owner will receive quotations on all other materials.

Montreal, Que.
F. H. Byrne, 2438 Park Ave., is the owner and general contractor of $25.000 store on Park Ave., near Bernard. Structural steel—Dominion Bridge Co., Ltd., Lachine, Que. Marble, carpentry, roofing. electric. plumbing, heating, plastering, painting and tiling to be let.

Ottawa, Ont.
The contract for plastering on $300 000 bank building being erected for the Bank of Nova Scotia, has been awarded to Murphy & Morrow, Billings Bridge. Carswell Construction Co., Ltd., Toronto, John M. Lyle, 230 Bloor W., Toronto.

Ridgeway, Ont.
The general contract for $67,000 Club House for Cherry Hill Club has been awarded to Albert Nye, Bridgeburg, Ont., who is also doing the plastering.

Thorndale, Ont.
McEachren & Sons, Alvinston, Ont., have been awarded the general contract for $10,000 cheese factory. H. Jones, Belton, Ont. Architects—W. G. Murray, Dominion Savings building, London.

Toronto, Ont.
The contract for plumbing in connection with dye house and manufacturing building for Toronto Carpet Mfg. Co., has been let to McNaughton & MacKenzie, 1029 Shaw St. Roofing, plastering and painting to be let by owners. Architects, Wm. Steel & Son, Ryrie Bldg.

M. A. Farley, 600 Coxwell Ave., has the contract for plastering, and Jas. Phinnemore, 367 Dupont St., the contract for painting in connection with alterations and addition to factory of Ault Wiborg Co. of Canada, 19 Charlotte St. H. A. Wickett & Co., Ltd., 127 Front East, have the general contract. Sproatt & Rolph, 1162 Bay St., are the architects.

General contract for $50,000 ice plant on Browns Ave., for Chapmans Ltd., has been awarded to Witchall & Son, 156 St. Helens Ave. Architects—Chapman & Oxley, Harbor Commission Building.

The general contract for alterations and addition to stables costing $25,000, south side Pears Ave. for the Canada Bread Co., Ltd., has been awarded to Fred Holmes & Sons, Ltd., 123 Bay St.

Vancouver, B. C.
Bedford Davidson, 1012 Broughton St., is the architect and general contractor for $9,500 garage and auto show rooms being built on Granville St, for Harry Hoffmeister, 1234 Burrard St.

Walkerville, Ont.
D. McBrayne, Assumption and Victoria Road has the general contract for $7,000 warehouse being built for T. H. Taylor & Co., Ltd., Chatham, Ont. No material purchased.

Windsor, Ont.
W. H. Willimot, 1044 Pelissier St.. has the general contract for $30,000 manufacturing plant on McDougal Ave. for McLean Lumber Co. Carpentry. plastering, painting, electric, heating and plumbing to be let. No materials purchased.

Residences

Hamilton, Ont.
Work has just started on 3 residences being built on Ottawa St., south of Justine, at a cost of $12,000. P. Ellis. 151 Ottawa S., is the owner and builder. Sub trades to be let.

Leaside, Ont.
Bulk or separate tenders are being received by Ed. Finn on all trades for apartment house to be built here. Plans and specifications with the owner, Miss L. Dunn, 26 St. Clair E., Toronto.

Montreal, Que.
The foundations are going in for 2 residences costing $12,000 on St. Urbain. between St. Viateur and Fairmount. P. Segal & M. Chait, 53 Mozart, are the

owners and builders. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing trades to be let.

Work is to start shortly on pair residences, $30,000, to be built on Lourin Ave. J. Hand, 4857 Sherbrooke W., is the owner and builder. Millwork, roofing, electric, and tiling to be let.

E. Martel, 631 Frontenac, is the owner and builder of 2 residences to cost $10,000 on 10th Ave., Ros., between Masson and C.P.R. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

The foundations are going in for $12,000 residence on L'Esperance between Ontario and Rouen. R. Galarneau, 3047 Waverley, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Work is to start shortly on $12,000 residence to be built on Prudhomme, between Sherbrooke and Cote St. Antoine. E. Berthiaume, 132 Joliette, Las., is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating and plastering to be let.

W. Begnoche, 106 Rivard, is the owner and builder of 2 residences costing $10,000 on 9th Ave., between Masson and St. Jerome. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Work is to start shortly for 2 residences costing $15,000, on Cote St. Antoine, near Wilson. J. P. Tremblay, 293 Prudhomme, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering and tiling to be let.

Excavating has started for 2 residences to be built on St. Joseph Blvd., between Fabre and Garnier, to cost $35,000. U. Boileau, 568 Garnier, is the owner and builder. All sub-trades to be let.

Work is to start shortly for 2 residences to cost $10,000 on Bordeaux, between St. Joseph Blvd. and St. Jerome. J. B. Tremblay, 1496 Chabot, is the owner and builder, and wants tenders on brickwork, roofing, electric, plumbing, heating, plastering, painting and glazing.

J. P. Tremblay, 293 Prudhomme, is the owner and builder of 2 residences on Vendome near Cote St. Antoine, to cost $15,000. Masonry, millwork, roofing, electric, plumbing, plastering and tiling to be let.

The foundations are going in for 4 residences costing $30,000, on Adam St., between Ville Marie and 1st Ave. L. O. Jalbert, 245a Chambly, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

E. P. Belair, 159 Dufresne, is the owner and builder of $15,000 residence on Chateaubriand, between Belanger and St. Zotique. Masonry, roofing, electric, plumbing and plastering to be let.

T. Tremblay, 1444 Chabot St., contemplates building 3 residences at a cost of $18,000, on Bordeaux, between St. Joseph Blvd. and St. Jerome.

Ottawa, Ont.

Tenders are being received by the owner, Wm. Joynt, Laurentian View, near Ottawa, or general contractor, R. W. James, Creighton apartments, Queen St., on plastering, electric, painting, heating and plumbing for $25,000 apartment house to be built corner Wellington and Holland Aves.

Foundations are in for $10,000 duplex residence on McLeod St. for C. Armstrong, care general contractors, Capital Contractors, Ltd., 233 Jackson Bldg. Tenders are being received by the general contractors for painting, plastering, plumbing and heating. No closing date set.

Three Rivers, Que.

Jos. Lacourse, 35 Bureau St., is the owner and builder of $9,000 residence on Ste. Angele St. Masonry, roofing, plumbing and heating to be let.

H. R. Winkenden, 97 St. Francois Xavier, is the owner and builder of $10,000 tenement house on St. Francois Xavier St. Masonry, electric, plumbing, ventilating, plastering and painting to be let.

Toronto, Ont.

P. L. Spiers, 92 Northcliffe Blvd., is the owner and builder of $15,000 residence, east side Dunvegan Rd., near Russell Hill Rd. Carpentry and masonry by day labor. Plastering, painting, heating, electric and plumbing to be let.

R. W. Tackabury, corner Westmount Dr. and Bathurst St., is the owner and builder of $9,500 garage and residence north side Westmount Drive, near Bathurst. Tenders being received on electric, plumbing and heating. Carpentry, masonry, painting and plastering by day labor.

Footings are going in for 2 residences, $6,000 each, west side Day Ave., near Morrison Ave. W. E. Maybe, 168 Sellers Ave., is the owner and builder. Heating, plumbing, plastering, painting and electric to be let.

Tenders are still being received by owners, Dominion Realty Co., Bank of Commerce Bldg., on electric and heating for 2 stores and apartments, $10,000 each, at 4 Bloor St. W.

Geo. Skipper, 67 Pine Crescent, contemplates building 50 residences, $4,000 each, east side Lawlor Ave., between Lyann & Gerrard East. 2 stories, shingle and brick construction.

The footings are going in for 2 residences, $7,500 each, east side Brummell Ave., near Baby Point Rd. A. Taylor, 40 Thornhill Ave., is the owner and builder. Painting, plastering, electric, heating, and plumbing to be let.

Plans for a $12,000 store and apartment, north-west corner Yonge St. and Deloraine, are being prepared by Benj. Swartz, 336 Dundas W., for A. Comella, 748 St. Clair W. Tenders will be called November 1. No material purchased.

Work is to start shortly on 2 pair residences costing $12,000, east side Elmer, near Norway. T. B. Brandson, 74 Aldwych Ave., is the owner and builder. Heating, painting, plumbing, electric and plastering to be let.

Jas. A. Brownlea, 634 Windermere Ave., is the owner and builder of $9,500 residence and garage at 632 Windermere Ave. No material purchased. Masonry, plastering, painting, heating, electric and plumbing to be let.

Excavating is being done for $15,000 residence on Russell Hill Rd., near Frybrook Ave. Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., on masonry and carpentry (labor only).

Ben. Swartz, 336 Dundas W., is preparing plans for 2 stores and apartments, costing $20,000, at 3237 Yonge St. No material will be purchased. will be called shortly.

The time has been extended till October 31 for receiving tenders for excavating, brick work, carpentry, concrete work, stone, steel, roofing, plastering, painting and glazing, tilework, plumbing and heating, ornamental iron, electric wiring and fire escapes, for $126,000 apartment house to be built south west corner Homewood and Wellesley Crescent. Plans and specifications with architects, Kaplan & Sprachman, 298 Dundas West.

The foundations are going in for 2 pair residences, $8,000 pair, on south side Teddington Park Ave., near Bocastle. Herb. R. Wilton, 86 Teddington Ave., is the owner and builder. Masonry day labor. Electric, heating, painting, plumbing and plastering to be let by owner.

Arthur A. Hobson, 70 Hilton Ave., contemplates building $15,000 residence on Russell Hill Rd., near Kilbary Rd.

The walls are up for 2 residences, $10,000 each, at 74-76 Dawlish Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Tenders are being received by the owners on tiling, painting, plastering, heating, electric and plumbing.

Jno. A. Moss, 411 Kennedy Ave., is the owner and builder of 6 residences, $7,500 each, south side Nelles Ave., near Armadale Ave. Masonry by day labor. Electric, painting, heating, plumbing and plastering to be let.

Jno. Lucas, 200 Gillard Ave., is the owner and builder of 3 pair residences costing $16,000 south side Queen near Woodfield Ave., and will let plastering, painting, heating, electric, and plumbing.

Verdun, Que.

E. S. Des Heneaux, 1194 Evelyn, is the owner and builder of $10,000 residence on 2nd Ave. Brickwork, roofing, electric, plumbing, heating and plastering to be let.

Foundations are going in for 2 residences on 2nd Ave. to cost $10,000. D. Lanther, 863 Lasalle Rd., is the owner and builder. Roofing, electric, plumbing and plastering to be let.

Vancouver, B. C.

J. V. & G. E. Lightheart, Point Grey, B. C., are the owners and builders of $50,000 apartment block, corner Spruce and 10th Ave. Roofing, electric, plumbing, heating, plastering and painting not let.

Westmount, Que.

J. Hand, 4857 Sherbrook Ave., is the owner and builder of 2 family residence, $15,000, on Prince Albert Ave. Millwork, roofing, electric and tiling to be let.

Pick & Reid, 919 Durocher, is the owner and builder of pair residences costing $30,000, on south side Cote Road, between Prince Albert and Victoria. Roofing and tiling to be let.

Winnipeg, Man.

Lount Engineering Co., Ltd., 501 Union Bank Bldg., are the owners and builders of $8,500 residence on Brock

(Continued on page 53)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Sewers

Village of Fort Erie

Sealed tenders, marked and addressed to the Clerk will be received until 8 p. m.

Friday, November 2nd, 1923,

for the construction of approximately one mile of trunk sewers and appurtenances.

Plans and specifications may be seen at the office of the Engineers or Village Clerk.

The lowest or any tenders not necessarily accepted.

A. E. SEATON, Clerk J. W. BARNHART, Reeve

JAMES, PROCTOR & REDFERN, LIMITED,
Consulting Engineers,
36 Toronto Street,
43 TORONTO.

TENDERS

Sealed tenders addressed to Dr. W. E. McNeill, Registrar, Queen's University, Kingston, Ont., will be received up to noon of

8th November, 1923,

for Excavation, Masonry, Carpentry, Roofing and Sheet Metal, Lathing and Plastering, Painting and Glazing, Steel Casement Window Frames and Sash, Plumbing, Heating and Electric Wiring required for

Residence for Women Students, Queen's University, Kingston, Ont.

Each tender must be accompanied by a marked cheque to the order of Treasurer, Queen's University, for 5% of the amount of the tender. Cheques of unsuccessful tenderers will be returned after contracts are awarded.

Performance Bonds shall be furnished at Owner's option and expense, by the successful tenderers.

The owners reserve the right to reject any or all tenders.

Drawings and Specifications may be seen at Registrar's Office, Queen's University, Kingston, and at Builders' Exchange, Toronto; or they may be had upon deposit of $15.00 for their safe return by applying to the Architects,

SHEPARD & CALVIN,
36 Toronto St.,
43 TORONTO.

Rock Excavation

I have the necessary machinery and equipment for all kinds of Rock Excavation. Am now open for contracts or sub-contracts with or without machinery. 15 years experience.

Wm. Bullard, Box 586, Burlington, Ont. 43-44

Parsons Trenching Machine

Model 36. digs 36 inches wide and 15 feet deep. Machine in good condition and has been used very little.

Charles R. Lennane & Co., 2631 Woodward Ave., Detroit, Mich. 43-44

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Steel Bridge

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Thursday, November 22, 1923,

for the construction of the super-structure of the bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The bridge consists of a 100′ Bascule Double Leaf Span with steel approach spans of 98′ and 158′ and the work includes a Creosote block floor on the Bascule span and concrete floors on the approach spans.

Plans and specifications and form of tender and contract may be seen at the office of the undersigned, Chatham, Ont. A set of plans and specifications may be had by depositing Twenty-five ($25.00) Dollars with the undersigned, which amount will be returned when the plans are returned if a bona fide tender is put in by the party obtaining the plans.

Tenders must be accompanied by marked cheques for at least five percent of the amounts of the tenders.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
43-46 County Engineer.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Addition to Archives Buildng, Ottawa, Ont.," will be received until 12 o'clock noon,

Wednesday, November 7, 1923,

for the construction of an addition to Archives Building, Ottawa.

Plans and Specifications can be seen and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, the Resident Architect, Department of Public Works, General Post Office, Toronto, and the Assistant Mechanical Engineer, Department of Public Works, Dominion Public Works Building, Place Royale, Montreal, P. Q.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. D'ESROCHERS,
Secretary.

Department of Public Works,
Ottawa, October 16, 1923. 43-44

Business Opportunity

A well established contracting and building firm desires to expand. Has work ahead and in view that will be very profitable. Solicits correspondence with contractor, builder or other parties with good financial standing. Apply Box 399, Contract Record, Toronto. 42-45

Dredge for Sale

All steel machine, ¾ yd. dipper, 30 ft. steel boom, 30 ft. steel axles, 35 H.P. Gas Engine. O. M. Loyer, 119 Harvey St., Chatham, Ont. 42-44

Machinery for Sale

20-ton Standard Gauge Industrial Locomotive Crane, mounted on 8 wheel M. C. B. Steel Car, enclosed steel cab, 50 ft. steel boom with 20 ft. extension.

2—1-yard clamshell buckets, newly rigged. Boiler, etc., in A1 condition. Box 390, Contract Record, Toronto. 40-43

Equipment for Sale

by

The Corporation of the City of Victoria B. C.

The Corporation of the City of Victoria, B.C., has for sale certain equipment used in the construction of the Johnson Street Bridge. The material for sale is as follows:

1 Land Derrick complete (less engine).
2 1 yard Concrete Buckets.
1 1 yard Smith Concrete Mixer and 9 x 9 Wache Vertical Steam Engine direct connected, also Hopper, Galvanized Iron Cylinder, Pipe and Fittings from Boiler.
1 Vertical Boiler, 25 H.P., 42 x 96, 148 lbs. working pressure will all fittings and Stack.
2 Cement Blowers.
1 Scow 27 x 90 with Sheds and Timberwork.
1 7 x 10 Double Drum Hoisting Engine. Timber Work for underwater Concrete guides also skid for 7 x 10 Engine.
1 12″ Vertical Centrifugal Pump with 40′ Shaft, Bearings, Guides, etc., also Timber Work.
1 12 x 8 Atlas Steam Engine.
1 niece 16″ Double Leather Belt, etc. { 48 ft. Rubber / 40 ft. Balatta Type / 22 ft. Leather }
1 72 x 108 Vertical Boiler.
1 No. 1 Union Iron Works Steam Hammer.
1 Diving Outfit complete, Pump, Scow, etc.
3 Diving Suits.
1 Derrick Scow complete, equipped with 9 x 10 American Hoist and Derrick Engine, also swinging Engine and all Fittings including Ejector, Westinghouse Air Compressor.
1 1-Yard Orange Peel Bucket.
1 Small Scow.

For further particulars and prices apply to the City Purchasing Agent, City Hall, Victoria, B.C.

E. S. MICHELL,
42-45 Purchasing Agent.

Structural Engineer

Young man, nine years' experience with contractors, architects and engineers in all building industries, as designer, draftsman, estimator and squad boss, desires similar position of responsibility with small contractor. Address Box 405, Contract Record and Engineering Review, 347 Adelaide Street West, Toronto, Ont. 45

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-45

SITUATION WANTED BY ARTIFICIAL STONE EXPERT whose 14 years experience covers every detail of the stone business—estimating, pattern-making and stone-making. All classes of work from blocks and posts to the highest class of architectural stone. Box 402, Contract Record, Toronto. 42-44

Saw Mill for Sale

Complete heavy portable mill, plenty of power, first class condition. 400 cords mixed slabs. Reasonable cash offer accepted. Fallon Brothers, Cornwall, Ont. 42-43

For Sale—$350.00

One used Concrete Mixer 12 cu. ft. dry capacity. Power tilting drum type, with side loader and gasoline engine thoroughly overhauled. K. W. Lewis, 105 Front St. E., Toronto, Ont. 41-42

For Sale

Model 28—Marion Steam Shovel with clamshell attachment.
1—No. 2 Mitchell Jaw Crusher (new)
Several screen sections, 48" standard Austin screen.
1—2½" Centrifugal Pump.
1—60 H.P. Locomotive type boiler.
1—60' Barber Green Portable Conveyor.

Above equipment may be seen at our quarry at Hagersville, Ontario.

Hagersville Quarries Limited, 4 Flora Street, St Thomas, Ont. 41-43

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

Mineral Production

A report just published by the Bureau of Statistics on Canada's mineral production during the first six months of 1923 shows that the mining industry has recovered from the slump of the last few years. The total value of products amounted to $87,152,248, being an increase of 44 per cent over the corresponding period of last year. The gold production amounted to 530,402 fine ounces, valued at $10,964,382. The silver production totalled 8,336,946 ounces valued at $5,506,489.

Building in Paraguay

It is expected that work on two buildings for the Colegio Internacional of Asuncion, Paraguay, will be started in the near future. Although the plans for the structures have not yet been completed, the cost of the work is estimated at approximately 100,000.

Residences

(Continued from page 51)

St., near Academy, and will purchase materials and let sub-trades.

CONTRACTS AWARDED

Longueuil, Que.

J. Bourdeau, 185 Fifth Ave., Outremont, has the general contract for 2 residences $12,000, being built on Guilbault St., for Les Maisans Brunet, Ltd., 83 Quinn Blvd. Plastering, H. Narvonne. Roofing, electric, plumbing, painting and glazing to be let. General contractor buys materials.

J. Bourdeau, 185 Fifth Ave., Outremont, has the general contract for 4 residences on Quinn Blvd., costing $24,000, being built for Les Maisans Brunet, Ltd., 83 Quinn Blvd. Plastering—H. Narbonne. Roofing, electric, plumbing, painting and glazing to be let. General contractor buys materials.

London, Ont.

Geo. Starke, care owner, Col. F. B. Ware, 476 Colborne St., has the general contract for $12,000 residence on Victoria St. W. Stuart Pavey, Standard Bank Bldg., is the architect.

Mount Royal, Que.

Bremner Norris & Co., Ltd., 65 McGill College Ave., have the general contract for 4 residences costing $32,000, for the Model City Housing Co., Montreal, Que. Masonry, carpentry, millwork, plastering, painting and glazing being done by general contractors. Roofing, electric, plumbing, heating and tiling to be let.

Montreal, Que.

The brickwork is going up for $20,000 residence on Courte, between Fort and Chomedy, for J. R. Douglas, Canada Cement Bldg. A. K. Hutchison, 10 Cathcart St., is the general contractor; plumbing and heating—W. G. Bailey, 145 Bleury St. Roofing, electric, painting and glazing and tiling to be let. No plastering.

A. K. Hutchison, 10 Cathcart St., has the general contract for $15,000 repairs to residence of A. Colville, 595 Pine Ave. Architects, Barott & Blackadder, Canada Cement Building. Roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Reid Bros., 2a Tower St., have the general contract for repairs to residence at 715 Pine Ave. W., to cost $12,000, for J. H. Birks, 715 Pine Ave. W. Masonry and carpentry by general contractor. Millwork, roofing, electric, plumbing, heating, plastering and glazing to be let.

A. Lemire, 6391 Chambord, is the owner and builder of 2 residences on Belgrave, between Sherbrooke and C.P.R., to cost $12,000. Contract for excavations and foundations has been let to A. & R. Billet, 6158 Peloquin. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Z. Lefebvre, 685 Decarie Blvd., has the general contract for 2 residences on Ponsard, near Decarier, costing $10,000, for A. S. Deguire, 30 St. James. Millwork, roofing, electric, plumbing, heating, plastering, painting and glazing trades to be let.

The following sub-trades have been let on $90,000 apartment house being built on Atwater Ave.: interior trim—Daniel Cream Lumber Co.; structural steel—Dominion Bridge Co., Ltd.; art stone—A. Desrosiers; marble and tiling—Brown & Sons; millwork—J. P. Dupuis Ltd.; roofing—Dominion Sheet Metal Works; electric—W. Staines, 587 Cadieux St.; plumbing and heating—Conroy Bros.; hardwood flooring—Jas. Shearer Co., Ltd.; painting—R. Rogers, 1466a Chabot; ornamental iron—Silverman Iron Works; refrigerators and dumb waiters—Darling Bros.; electric fixtures—L. C. Barbeau Co., Ltd.

The following sub-trades have been let on $40,000 residence being built on Ontario St. for W. D. Hutchins, 381 Oliver Ave.: millwork—Geo. Roberts, 79 Lagauchetiere; roofing—Geo. W. Reid & Co., 37 St. Antoine; plumbing and heating—J. Colford, 479 Guy St.; plastering—G. G. Knot & Co.; painting and glazing—Henry Morgan & Co., tiling—J. R. Locker, 143 Mansfield. General contractors are Fussing & Jorgenson, 6 Durocher St. W. Architect, J. Melville Miller, 364 Dorchester St.

Cook & Leitch, 358 Beaver Hall Hill, have the general contract for $12,500 residence on Dunlop Ave. for J. A. D. Annette, 1727 Hutchison. Architect is A. Allen, 358 Beaver Hall Hill. Roofing, electric and plastering to be let.

The foundations are going in for 2 flats and 1 store, corner 9th Ave. and Masson, Ros. Owner, Phillias Maheu, 1811 Masson; architect, J. E. DePatrick, 381 Fouth Ave., Ros; excavation and foundations— A. Belander, 212 Holt St.; millwork—A Marot, care architect. Roofing and plumbing to be let.

Owen Roberts, 6967 Sherbrooke W., is the owner and builder of 17 pair semi-detached residences costing $140,000 on Hampton, between N.D.G. and Monkland. The following sub-trades have been let: millwork—Daniel Cream, Ltd.; roofing—D Nicholson Co.; electric—W. E. Booth, 600 Girouard; plumbing—Jas. Robertson & Co., Ltd.; heating—Imperial Radiator Co., Ltd.; tiling—J. H. Dodgson Co., Ltd.; brickwork—Webster & Sons, Ltd. Plastering, painting and glazing by day labor.

Ottawa, Ont.

The following sub-trades have been let on $9,000 residence being built on Central Terrace: H. L. Allen—electric; H. Bronke; plumbing and heating; Murphy & Morrow—plastering; Mr. Hooper, 4th Ave.—painting. S. D. Murphy, 118 Third Ave., is the owner and general contractor.

Geo. A. Eaman Co., Ltd., 102 First Ave., has the general contract for $9,000 residence on Clemow Ave., for J. R. Howie, care general contractor. 12,000 brick and materials for 30 cu. yds. of concrete and 800 sq. yds. of plaster required. No materials purchased.

The following sub-trades have been let on 5 residences, $5,000 each, being built on Renfrew Ave., by Cowie & Moore, 414 Sunnyside Ave., owners and general contractors: electric—Art. Davis, Bronson Ave.; plumbing—William Bros.; heating—Pease Foundry Co.; plastering—A. Skillen, Morris St.; painting—G. Green, Bank and Fourth Ave.

Crowe & McDonald, 46 College Ave., have the general contract for $12,000 stores and apartments on Bank St., for H. Brouse, 105 Bank St.

Point Grey, B. C.

J. H. Whittaker, 1425 Burrard St., Vancouver, is the architect and general contractor of $10,500 residence at 1374 Laurier Ave., for Mrs. C. B. Mansell, 1521 Burnaby St., Vancouver.

Quebec, Que.

J. A. Laberge, L'Ange Gardien, has the general contract for 4 family residences on St. Valier St. to cost $9,500, for Rodolphe Marquis, St. Valier St.

Leo. Proteau, 4th St., Limoilou, Que., has the general contract for 2 duplex residences on Laurier Ave., costing $16,000, for H. B. Premont, 9 Cremazie St.

Saskatoon, Sask.

A. W. Bell, 411 Avenue G, South, has the general contract for 2 residences, $4,500 each, on Ave. H., for A. S. King & Co., Canada Bldg. Electric, plumbing and heating not let.

Three Rivers, Que.

The foundations are in for $10,000 tenement on Ste. Angele St., being built for Zephirin Proulx, 314 Ste. Cecile St. Materials are being supplied by Materiaux de Construction Ltd., 8 Ste. Marie St.

Toronto, Ont.

Parker & Ryan, 2165 Danforth Ave., have the contract for heating, and A. Jones, 1009 Woodbine Ave., the contract for plastering, in connection with 2 residences, costing $16,000 at 56-8 Seventh Ave. W. H. Royle, 2164 Danforth Ave., is the owner and builder. Electric and plumbing let. Painting by day labor.

The following contracts have been awarded on 2 stores and apartments $12,000 each, north side Gerrard East, near Highland Ave.: painting—Wm. Pedditt, Chorley Ave.; plumbing—J. C. Clayton, 176 Malvern Ave.; heating—T. Eaton Co., Ltd.. plastering—J. T. Pritchard, Dawes Rd. H. McSherry, 33 Gleveholme Blvd., is the owner and builder.

Wm. Pugh, Don Mills Rd., is the owner and builder of 4 residences, $4,000 each, north east corner Dawes Rd. and Coleman Ave. Electric—B. Belmont, 77 Westlake Ave.; heating—A. Lyford, 11 Wiley Ave.; plastering—owner by day labor; painting—A. M. Simmons, 612 Jones Ave.; plumbing—J. T. Bowes, 1276 Danforth Ave.

G. Rogers, 560 Rhodes Ave., has the contract for masonry on 2 pair residences, $8,000 each, at 588-94 Rhodes Ave. B. Grant, 46 Woodycrest Ave., is the owner and builder. Plastering, painting, electric, heating, and plumbing to be let.

The following sub-trades have been let on 3 pair residences, $6,000 a pair, west side Woodfield Rd., near Applegrove: Taylor Bros; plumbing—R. J. Ritchie, 851 Logan Ave.; heating—Mason & Allen; plastering—Wickin & Page; painting—A. M. Simmons, 612 Jones Ave. A. Copeland, 231 Milverton Blvd., is the owner and builder.

J. J. Smith, 302 Milverton Blvd., is the owner and builder of 4 residences, $4,000 each, north side Lyall, near Kingswood Rd. Carpentry—S. Russell, 15 Mendle Ave. Painting, plastering, electric, heating and plumbing to be let.

The following sub-trades have been let on 1 pair residences $4,500 each, west side Woodfield, near Queen East: electric — Taylor Bros.; plumbing — R. J. Ritchie, 851 Logan Ave.; heating—Mason & Allen; plastering—Wickin & Page; painting — M. Simmons, 612 Jones Ave. A. Copeland, 231 Milverton Blvd., is the owner and builder.

Geo. Lankin, 43 Thorncliffe Ave., is the owner and builder of 2 pair residences, $7,500 pair, at 421-27 Jones Ave.; electric—T. B. Kilner, 601 Jones Ave.; plumbing—J. Fraser, 802 Danforth Ave.; painting—W. Rowe, 23 Muriel Ave.; plastering—Jas. Michael, care owner.

Contract for heating and plumbing in connection with $9,500 duplex residence at 742 Coxwell Ave., has been awarded to Geo. Copperthwaite, 118 Langford Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Painting and plastering to be let.

George Copperthwaite, 119 Langform Ave., has the contract for plumbing and heating of $9,000 duplex residence at 744 Coxwell Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Painting and plastering still to be let.

C. A. Scott, 22 Stanhope Ave., has the general contract for $12,000 residence north side Inglewood Dr., near McLennan Ave., for A. P. Whealay, care architects, J. Hunt Stanford & Son, 67 Yonge Arcade.

The following sub-trades have been let on 2 pair residences, $7,000 each, west side Coxwell, below Danforth; electric—T. Bowman, care owner and builder, A. E. Bannister, 50 Keystone Ave. Plumbing W. Adams, 103 East Lynn; heating—Pollitt & Dilks, 16 Cedarvale Ave.; painting—J. Porter, 51 Rosevear Ave.; W. E. Page, 152 Meagher Ave.

Tabor-Ford Construction Co., 213 Raglan Ave., have the general contract for $15,000 residence and garage south side Heathdale Rd., near Pinewood, for S. S. Snider, LaPlaza apartments. Electric, plumbing, heating and plastering to be let.

W. Adams, 103 East Lynn Ave., has the contract for plumbing, and W. J. Merrill, 866 Kingston Rd., the contract for heating in connection with a pair residences, $7,500 each, on west side Coxwell, below Danforth. J. T. Turner, 990 Woodbine Ave., is the owner and builder. Electric and plastering to be let.

A. Bunting, 6 Jordan St., has the general contract for $15,000 residence and garage at 4 Burnside Ave., for Jas. B. Rae, 24 Wychwood Ave. Masonry, A.C. Salisbury, 668 Pape Ave. Balance of trades to be let.

Verdun, Que.

H. Martin, 438 Antoine St., has the general contract for 2 residences costing $14,000 on Third Ave., being built for E. Gaudron, 815 Atwater. Roofing, electric, plumbing, heating and plastering to be let.

G. H. E. Blacklock, 104 Crescent, has the general contract for $10,000 cottage on Lasalle Road for Estate J. Greenshields, care Royal Trust Co. Subtrades to be let.

Vancouver, B. C.

The following sub-trades have been let on $550,000 apartment block, corner Georgia and Hornby Sts.; electric—C. H. E. Williams Co., Ltd.; plumbing—W. A. Brown, Ltd.; terra cotta—Wm. O'Neil Co., Ltd. Sheet metal, ventilating, heating, plastering and painting not let. Smith Bros. & Wilson, 711 Credit Foncier, are the general contractors. Architects, McCarter & Nairne, 710 Northwest Bldg.

Walkerville, Ont.

Ward Bros., Dougall Ave., Windsor, have the general contract for $9,000 residence on Devonshire Road, for Walter A. Fuller, 413 Ouellette Ave., Windsor. Painting, plastering, plumbing and electric to be let. No materials purchased

Westmount, Que.

Pick & Sheppard, 360 Hingston, are the owners and builders of 1 pair and 1 detached residence on Upper Lansdowne Ave.: tiling—J. H. Dodgson Tile & Mossaic Co., Ltd. Millwork, roofing, electric and plastering to be let. Plumbing and heating, day labor by owners.

Sub-trades as follows have been let on $10,000 residence being built on Delorimer Ave for Dr. J. Choquette, 1063 Delorimer: roofing and plumbing—Mr. Archambault, care 1921 St. Catherine; electric — R. Chamberland; plastering — Girard & Girard. Painting and glazing, day labor. H. Cote, 1921 St. Catherine E., is the general contractor.

The following sub-trades have been let on $150,000 apartment house north east corner St. Catherine and Melville: refrigerator—W. Knight, care owner and builder, Nard Construction Co.; telephone system — W. Staines, 587 Cadieux; painting and glazing — O. Perras, 1162 Henri Julien; tiling—Pizzagalli's Terrazzo Tile Mfg.; ornamental iron—Silverman & Co., 587 Colonial Ave.

Windsor, Ont.

Sam. Keyser, 1312 Victoria Ave., has the general contract for duplex residence costing $8,500 on London St., for J. H. Rodd, Sandwich St., Sandwich, Ont. No materials purchased. Electric, plumbing, plastering and painting to be let.

Power Plants, Electricity and Telephones

Cayuga, Ont.

The town council has received estimates from the Hydro Power Commission for a hydro system costing $20.000. A vote of ratepayers will probably be taken shortly.

Pictou County, N. S.

Nova Scotia Power Commission contemplate laying a cable 950 ft. long. Plans have been filed with Department and work will start in about one month.

CONTRACTS AWARDED

Drummondville, Que.

Southern Canada Power Co., Ltd., Montreal, have awarded Foundation Co., 233 Broadway, New York, the general contract for concrete dam and power house in connection with $2,500,000 power development (approximately 30,000 h.p.) 3 miles from city on St. Francis River.

Portneuf, Que.

Canadian Vickers, Ltd., Montreal,

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Windsor, Ont.	- -	Thompson Auto 339 Pitt Street West

FEDERAL MOTOR TRUCK CO.
Detroit, Michigan

Que., have been awarded the contract for 1, 4,000 h.p. turbine, 360 r.p.m., 64 ft. heading, in connection with Portneuf Hydro-electric development.

Point Du Bois, Man.

The city of Winnipeg has awarded the contract for turbines and governors to the Canadian Vickers, Ltd., Montreal, Que., at $118,800; alternators—Swedish General Electric Ltd., Toronto, Ont., at $213,000, together with $5,275 for spare parts.

Toronto, Ont.

Toronto Electric Commissioners have awarded the general contract for $160,000 sub-station, south cast corner Danforth Ave. and Morton Rd. to Jackson-Lewis Co., Ltd., Ryrie Bldg. Excavation—Lioni & Co., 1466 Dufferin St. Other trades to be let by general contractor.

Miscellaneous

Edmonton, Alta.

Tenders will be received by city commissioner C. J. Yorath, till October 29 for the supply of 30,000 lbs. of three quarter inch lead pipe, f.o.b. city yards.

CONTRACTS AWARDED

Port Arthur, Ont.

Canadian Dredging Co., Ltd., Midland, Ont., have been awarded the general contract for breakwater extension at $450,000.

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Late News

Arrow Park, B. C.

Tenders will be received till November 9, by the Dept. of Public Works, through the secretary, R. C. Desrochers, for the reconstruction of a pile bent and timber decking wharf and on fending boom. Plans with district engineer, Nelson, B. C., and Post Office, Arrow Park, B. C.

Brandon, Man.

Tenders are being received till October 31 by the Minister of Public Works, Hon. W. R. Clubb, for sub-trades on the new Receiving Unit, Hospital for Mental Diseases, for ornamental iron and bronze work and millwork.

Carleton Place, Ont.

N. H. Gorde has the general contract for $8,000 curling rink being built for Carleton Place Curling Rink Co. Ltd., and buys material.

Dixie, Que.

Tenders are being received till October 29 by the architect, C. R. Tetley, 314 Beaver Hall Hill, Montreal, in connection with club house to be built north of C.P.R. tracks for Summerlea Golf Club. Plans and specifications with architect.

Essondale, B. C.

Henry Whittaker, Victoria, B. C., is preparing plans for $200,000 central heating plant for Mental Hospital. Reinforced concrete and brick construction.

Ingonish, N. S.

Tenders are being received by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont., till October 31, for reconstruction of breakwater. Plans and specifications at Dept., at office of district engineer, Bellevue Bldg., Halifax, and at Post Office, Ingonish.

Jonquiere, Que.

Tenders are being received till October 30 by the clerk, J. M. Lacroix, for generator in connection with $75,000 extension of hydro-electric power development. Additional information with engineer, J. F. Grenon, Chicoutimi, Que.

Kingston, Ont.

Tenders addressed to the Registrar, will be received by the architects, Shepard & Calvin, 36 Toronto St., Toronto, till November 8 for all trades required in erection of a Womens Residence for Queens University. Tenders must be accompanied by a marked cheque to the order of the Treasurer, Queens University, for 5% of tender. Plans and specifications may be seen at the offices of the Registrar, Kingston, and the architects in Toronto.

London, Ont.

R. G. Wilson & Sons, have the general contract for remodeling store to cost $20,000, owned by Hubert Ashplant & Sons.

Montreal, Que.

Pick & Sheppard, 360 Hingston, is the owner and builder of pair residences on Upper Lansdowne Ave. costing $30,000. Millwork, roofing, electric, plastering and tiling to be let. Plumbing and heating by day labor.

A. Boileau, 848 Champagneur, has the general contract for 3 residences, $14,000, on Champagneur, near Van Horne, for J. N. Lavigne, 1555 Jeanne Mance. All sub-trades to be let. Architect, T. Benoit, 71a St. James St.

Ottawa, Ont.

The walls are going up for $60,000 addition to store on O'Connor St., owned by L. N. Paulin, Sparks St. Plumbing and heating—The Garth Co.; plastering — Murphy & Morrow, Billings Bridge. Balance of trades not let. Architect, J. A. Ewart, Jackson Bldg. General Contractor, Alex. Garvock, corner Sparks and Bank Sts.

N. Hollister, 514 Bay St., has the general contract for $12,000 residence on Carling Ave., for Margaret A. Holloway, care general contractor. 18,000 brick and materials for 40 yds. concrete and 1100 sq. yds. plaster. No materials purchased. General contractor buys.

J. Couillard, 92 Putnam Ave., is the owner and general contractor of $14,000 apartment house on Butternut Ave. No materials purchased. 25,000 brick and materials for 38 cu. yds. of concrete and 2,100 sq. yds. of plaster required.

Outremont, Que.

Work is to start shortly on 6 residences, $84,000, on McEachran Ave. A Boileau, 848 Champagneur, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Port Colborne, Ont.

The town council contemplate a waterworks plant to cost $90,000. The adoption of plon is subject to passing of By-law in December. Consulting engineer, E. H. Darling, 72 James St. N., Hamilton, Ont.

St. Catharines, Ont.

The foundations are in for $130,000 Terminal building being built for Toronto, Niagara & St. Catharines Rly. General contractors, Frid Construction Co., Hamilton. Tiling, painting, plumbing, heating, electric, ventilating, roofing, sheet metal and carpentry to be let by general contractor.

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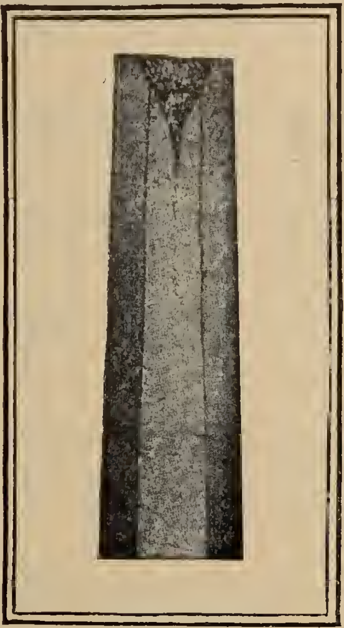
Steel ingots which has been cut in half showing the "pipe" in the centre and the porous segregated portion at the top. In the manufacture of rail steel the ingot is all pipe and segregation, thus carefully cropped to remove insuring a steel of the highest quality.



Quality and Metal Fatigue

The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation,, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity. and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in exactly the same condition as it was prior to its years of service.

RAIL STEEL BARS rolled from railroad rails have provided a concrete reinforcement of quality—quality obtained through care in manufacture—a degree of quality possessed by no other reinforcement steel.

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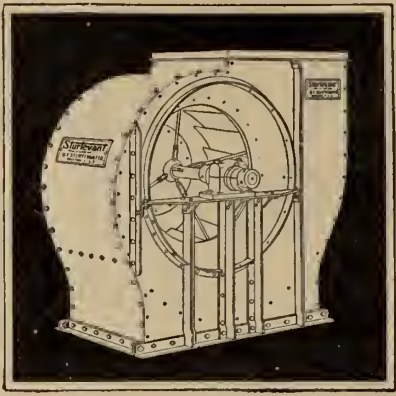

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is required in buildings where people congregate, either for work or recreation.

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Aluminum Paint Makes Radiators Less Efficient

The aluminum or bronze paint generally applied to radiators greatly reduces their effectiveness and makes it necessary to have a larger surface for the same heating effect, according to experiments performed by Dr. W. W. Coblentz of the U. S. Bureau of Standards. Dr. Coblentz finds that heat radiated from an aluminum painted radiator surface is less than a third of that emitted by a radiator of the same size painted with a non-metallic paint, enameled, or simply allowed to rust.

On the other hand he finds that aluminum paint is a very effective means of reducing the amount of heat transmitted through a thin material. Applied to the under side of a tent or awning it reduces by three-forths the amount of heat from the sun which gets through the cloth, while if used on the cover of an automobile or ice wagon it cuts in half the heat let through and makes the temperature inside the vehicle more nearly that found in natural shade, thereby making it much more comfortable.

Artesian Wells to Make a Desert Productive

European engineers are of the opinion that large areas of the Sahara Desert could be made fertile by boring Artesian wells like those now in use in arid sections of Australia.

Gaston Imbeaux, Chief Engineer of the Public Works Department of the French Government, points out that the sinking of wells has made that commonwealth one of the greatest pasture countries in the world, and that by adopting similar methods in the Sahara great stretches of that dry region could surely be transformed into grazing lands for sheep, etc.

There is undoubtedly an abundant supply of water beneath the vast sand wastes of Africa, and Monsieur Imbeaux declares that "if the French authorities would undertake to sink shafts to those subterranean wells, the future success of the projected trans-Sahara railway would likewise be assured."

Stucco Should Always be Painted

Whenever stucco is used it should be painted whether on lath or masonry, says a writer in the Washington State Architect. In the best of stucco work there are hair cracks through which moisture can find its way. In cold weather this moisture freezes and gradually expands and forces the stucco out. Sooner or later large cracks will appear. All of this may be avoided by using two or three heavy coats of concrete paint. The paint fills up the minute cracks and prevents moisture from entering. The appearance of the stucco is very much improved also by the introduction of some color in the paint.

Unique Go-Devil

Something unique in go devils was tried out not long ago for the purpose of opening a passageway in a clogged sewer. A small alligator was made fast to a wire and lowered down the manhole. Proceeding to the next manhole, the little creature dragged after him the wire to which knotted chains were afterwards attached. It was a simple matter then to work the chain back and forth and thus to remove the obstruction.

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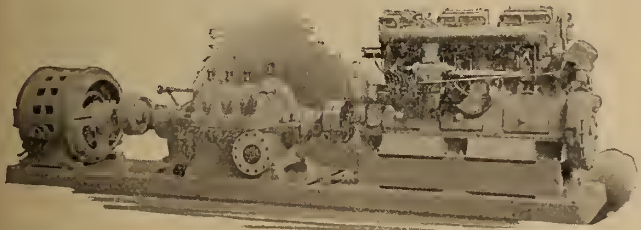

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Lamatco can be obtained in six standard widths and two standard lengths, thereby eliminating cutting to waste and unnecessary work.

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CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	7.00	3.50-5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
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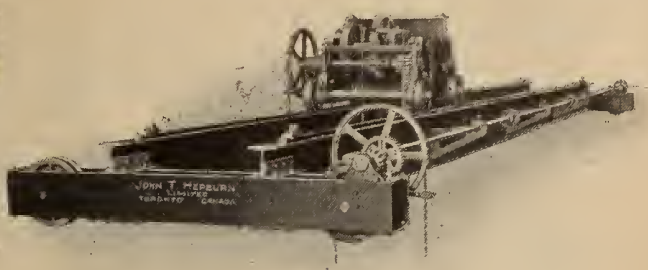

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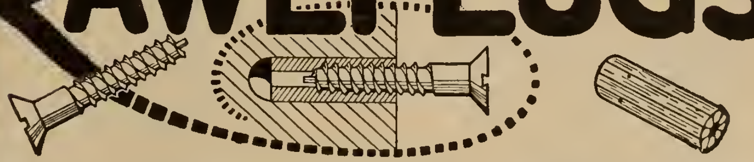

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Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
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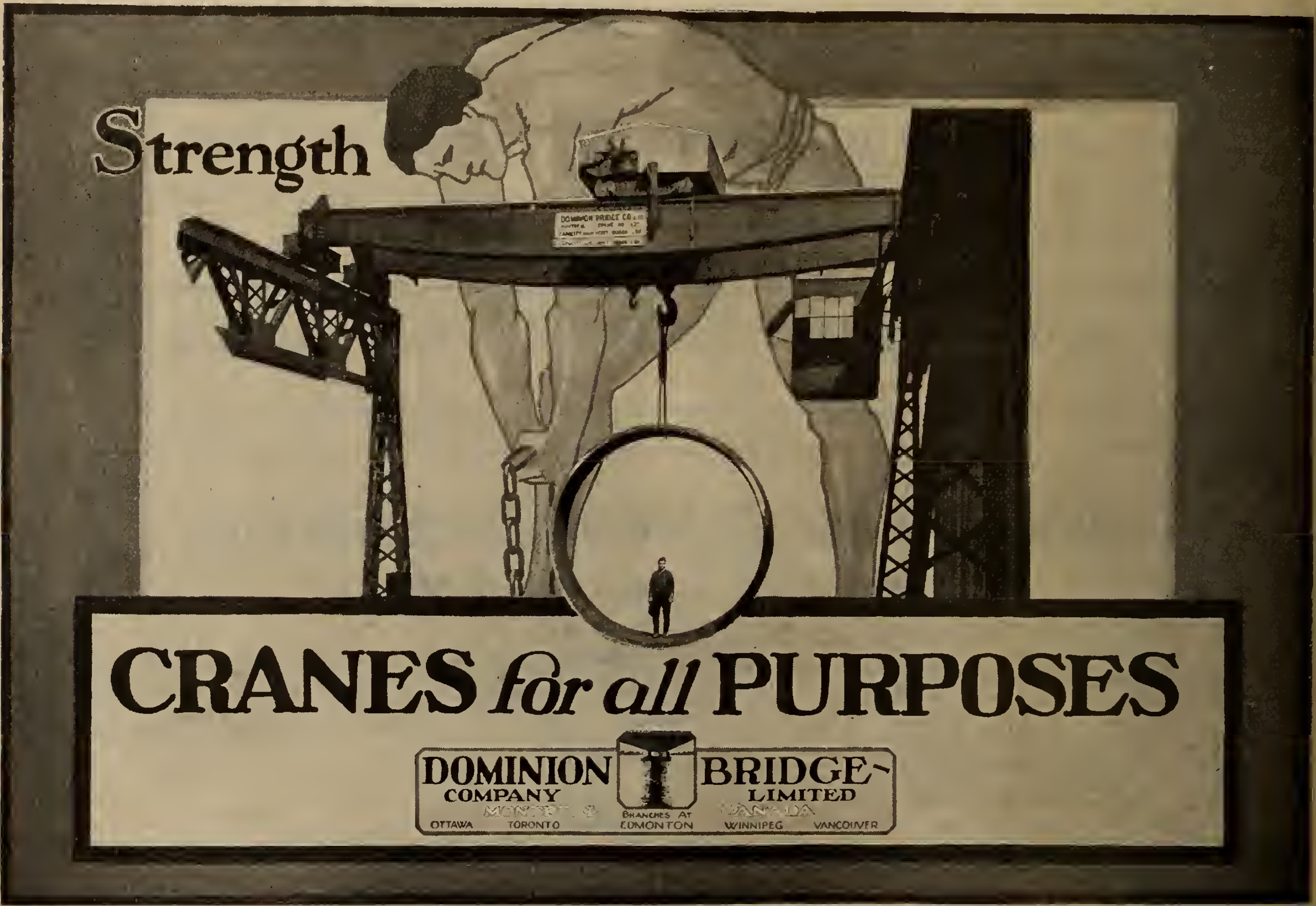
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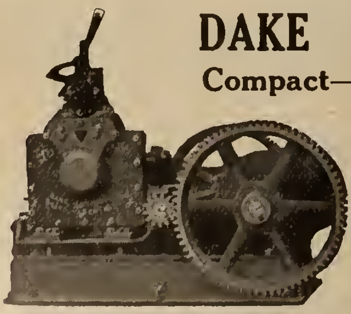

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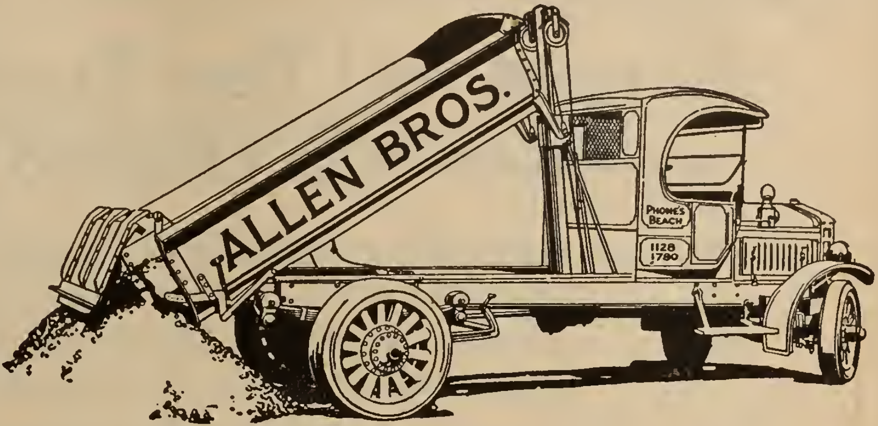

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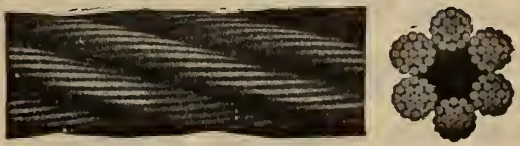

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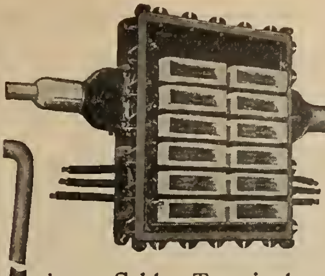

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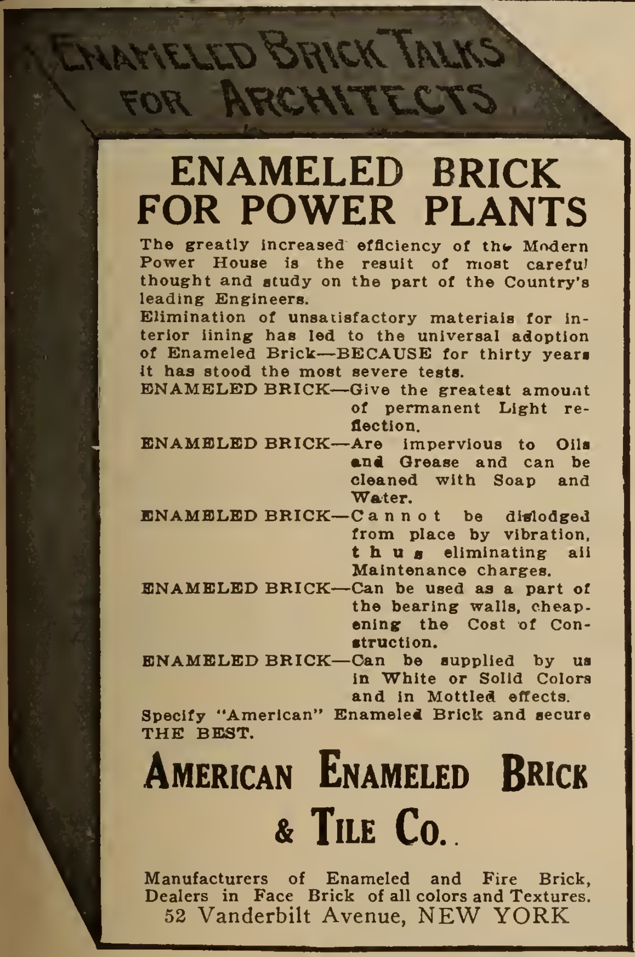
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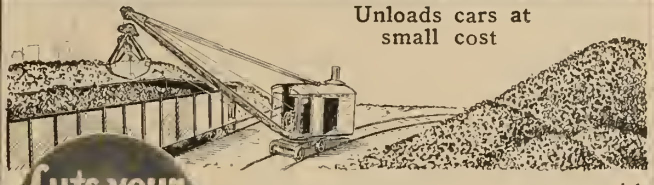

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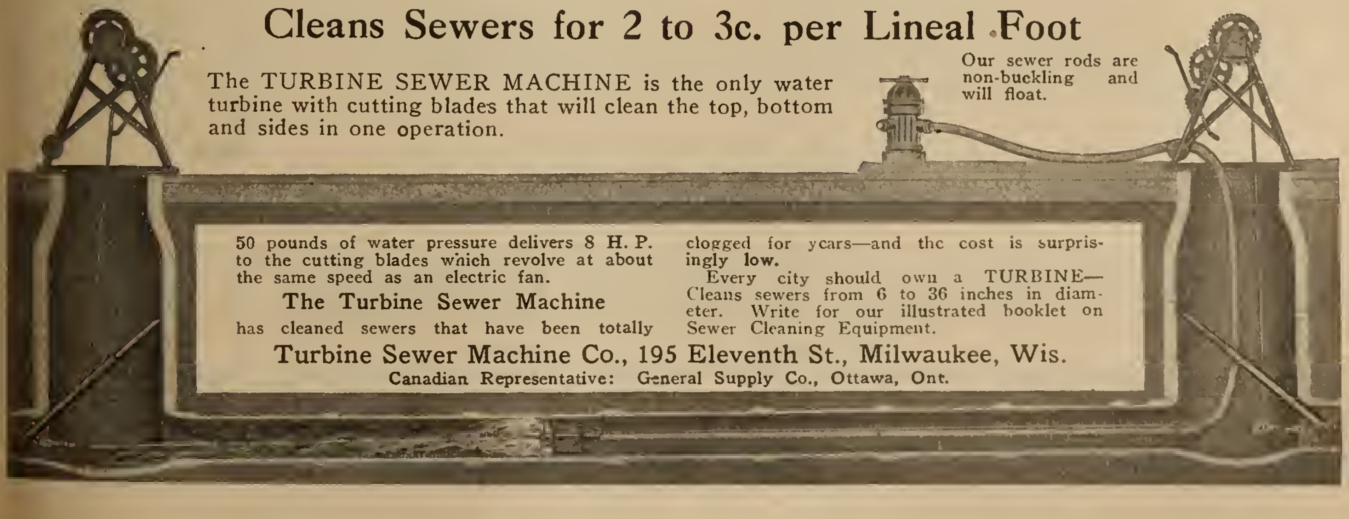

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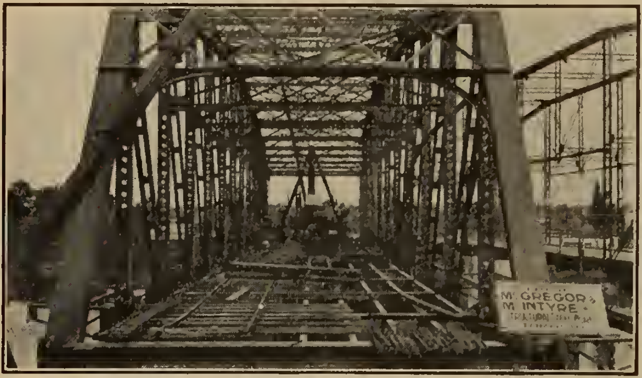

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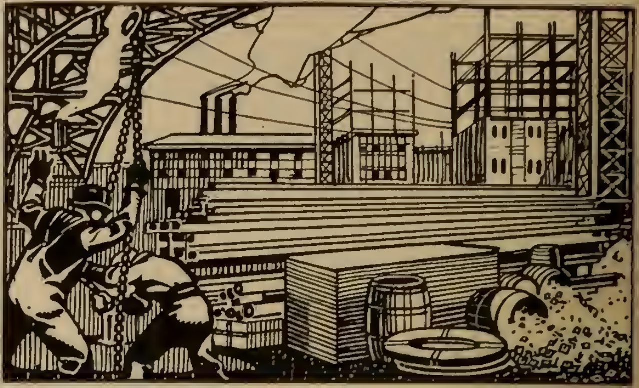

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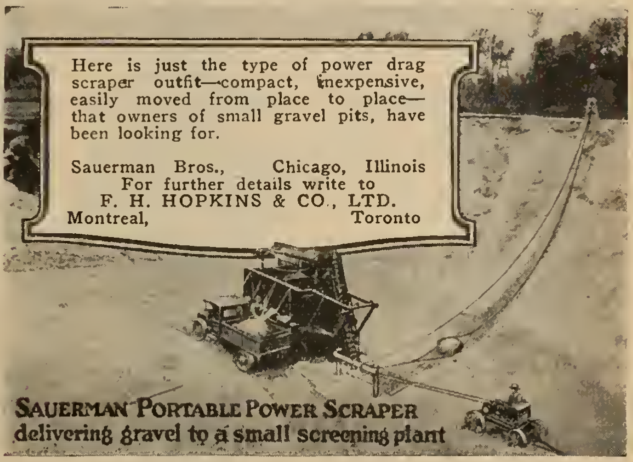

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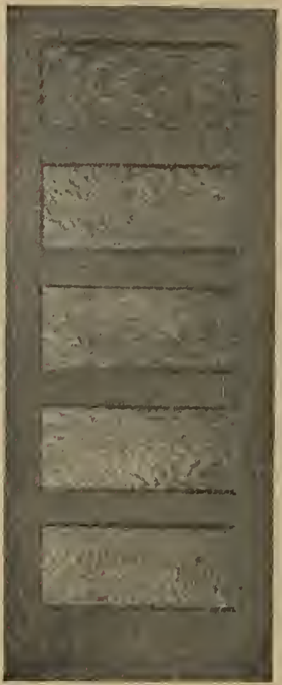

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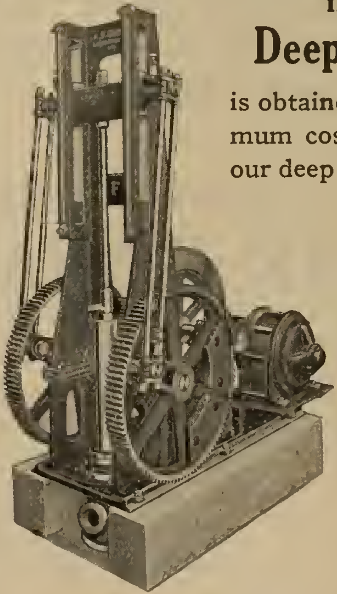

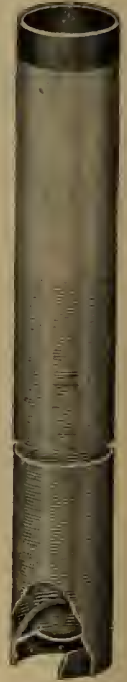

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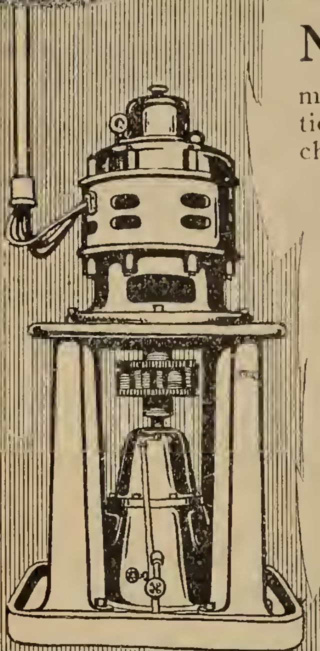

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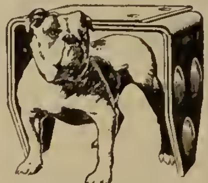

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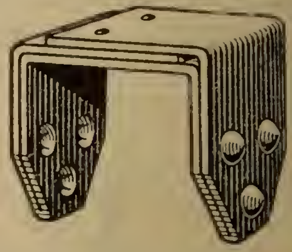

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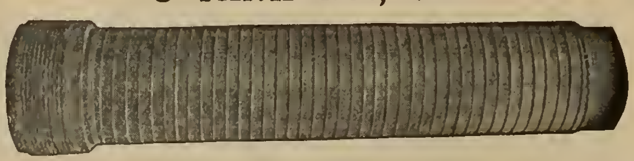

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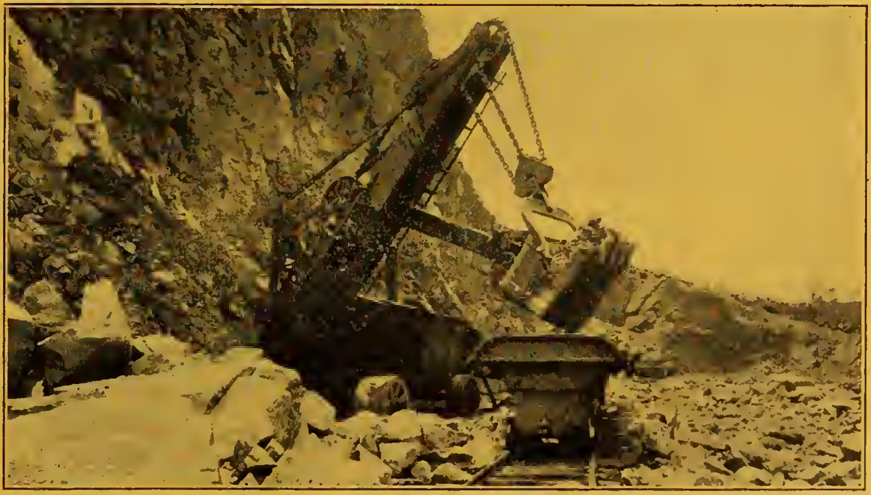

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Vol. 37 Toronto, October 31, 1923 No. 44

Contract Record and Engineering Review

The larger illustration shows King Street, Oshawa, looking west from the corner of Simcoe Street. Its clean, business-like appearance is in striking contrast with the other view of this same street taken before resurfacing was begun (insert).

IMPERIAL
Asphalt
PRODUCTS

New roads on old

Oshawa is growing very rapidly both in industrial wealth and population. It is today the centre of both the export and domestic business of the automobile industry in Canada, and is popularly known as the "Detroit of Canada."

As with other progressive cities, Oshawa has its paving problems, but after experimenting with certain types of so-called permanent pavements, Oshawa has turned to Hot-Mix Asphalt as being the most satisfactory and economical type over a long period of years. Last year 40,000 square yards and this year 70,000 square yards of Hot-Mix Asphalt ("Standardite" type) have been laid in Oshawa by the Standard Paving Company Limited, under the supervision of Mr. W. C. Smith, City Engineer. In this work, the old road was used as the foundation after repairing where necessary.

The resurfacing of old roads in this way is a very satisfactory practice, conserving as it does, previous investments, yet providing a new pavement which is waterproof, shock absorbing and very durable.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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Steel
Double-Coupling
eliminates
all leaks

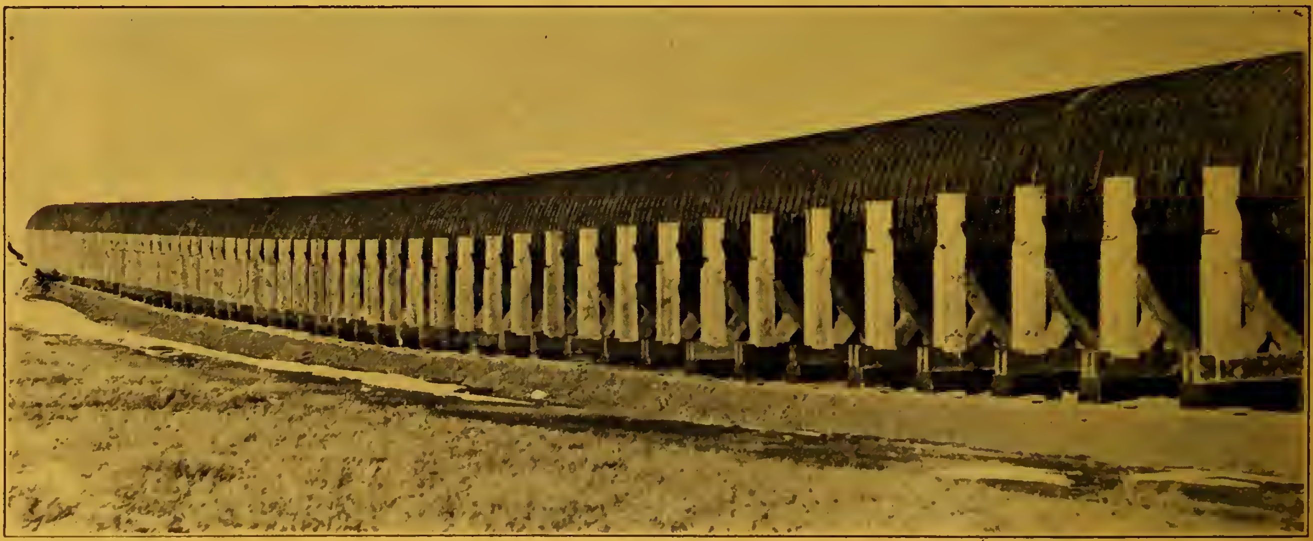
DURABILITY!

Double
Burlap Jacket
secures permanency
in all soils

TWO MILES of GOOD PIPE for the PRICE of ONE

Those who cling to the theory that a combination of efficiency and durability is possible only with Metal Pipe at a fancy price, have not fully investigated the improved standard of Wood Pipe. RESULTS in several Western Municipalities are most convincing.

WIRE-WOUND WOOD STAVE PIPE
CONTINUOUS STAVE PIPE
WOODEN TANKS
SILOS

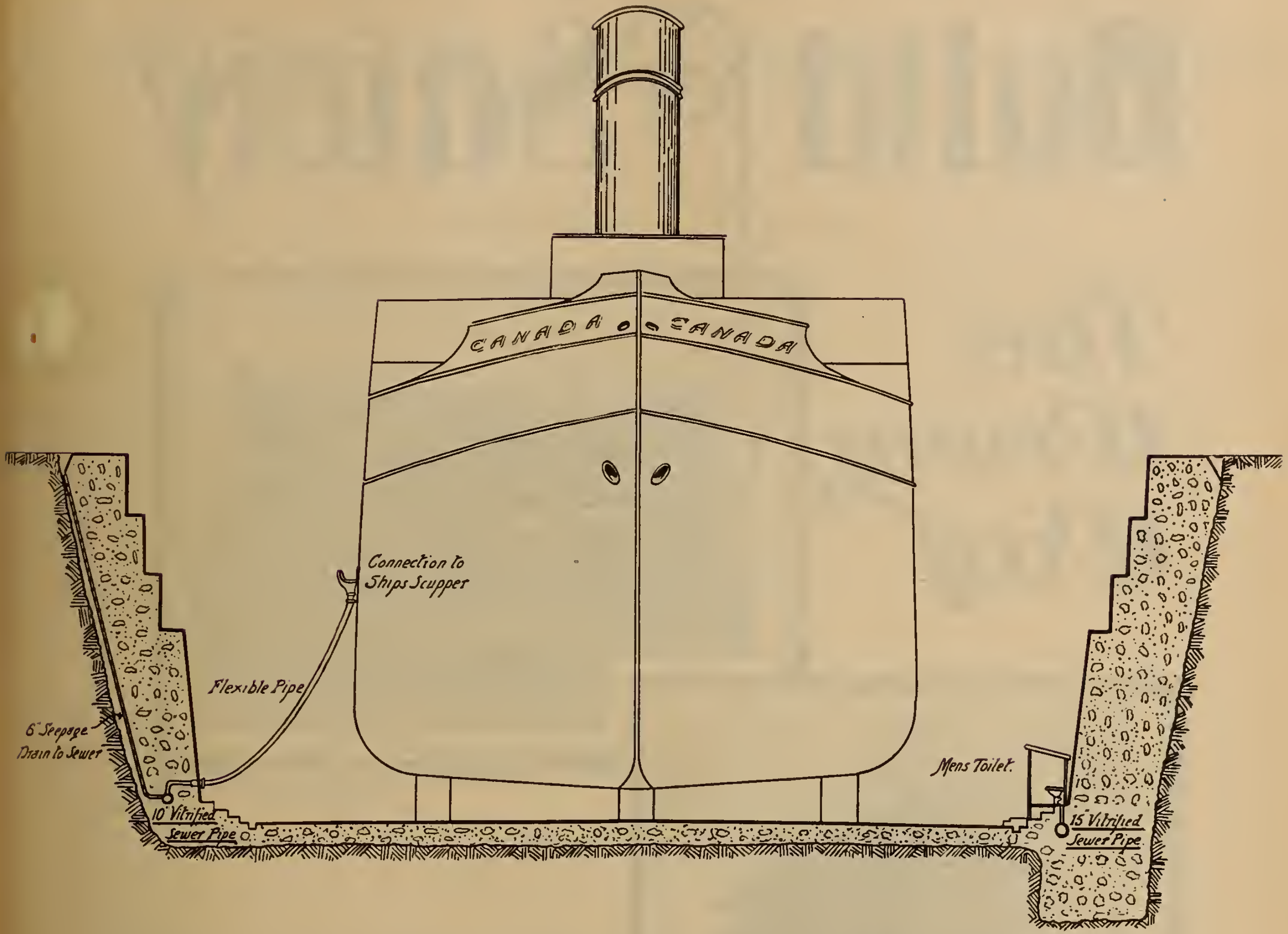


Continuous-Stave Pipe, 10½ feet in diameter, built by us for Lethbridge Northern Irrigation District (Alberta)

Let us quote on your requirements—Catalogue forwarded on request.

CANADIAN PIPE COMPANY, LIMITED

550 Pacific St., VANCOUVER, B.C.



The largest Drydock in the World

has a Sewerage System of

VITRIFIED CLAY PIPE

The new Drydock at St. John, N. B., officially opened this week is believed to be the largest and most up-to-date drydock in the world. An innovation in drydock construction is the provision of a sewerage system providing sanitary accommodation both for the ship in the dock and for the men engaged within the dock itself.

In important engineering works such as this all materials of construction are carefully chosen to secure the utmost efficiency, and consequently Vitrified Clay Pipe was selected for the sewerage system.

Through the sewers will flow not only the varied discharges from the ship, but ground water seepage from behind the massive walls and salt water for flushing. It was realized that Vitrified Clay Pipe would not disintegrate, incrustate, or corrode and would last indefinitely, and it is for the same reasons that the foremost sanitary engineers of the world specify Vitrified Clay Pipe for the construction of public sewers. For permanency and utmost efficiency, specify and use Vitrified Clay Pipe.

Vitrified Clay Pipe Publicity Bureau. 9 Wellington St. East, Toronto.
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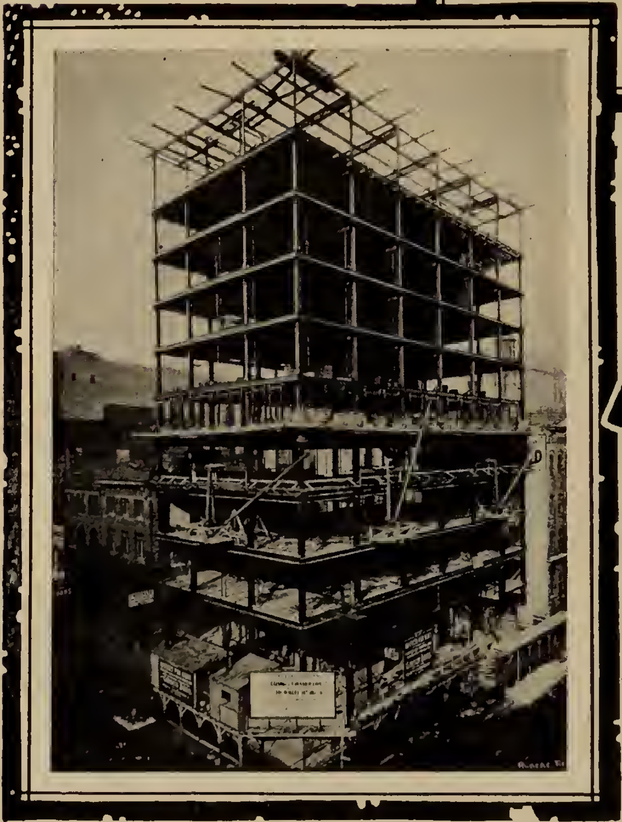
Build for Safety

The Wrong Way

Photo by Underwood and Underwood.



Structural Steel framework of the Reford Building, Toronto

The Strong Way

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STRUCTURAL STEEL

Issued by the
Structural Steel Association

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Highways Report

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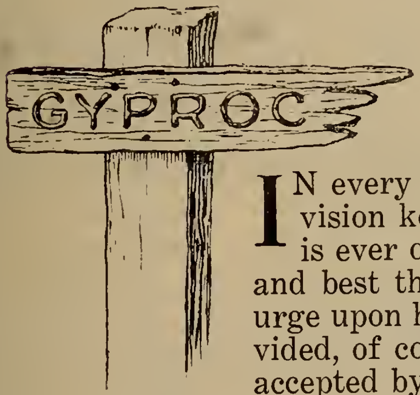

IN every community there is a live-wire dealer whose vision keeps him constantly ahead of the game; who is ever on the alert to give his trade the very newest and best the market affords; and who is not afraid to urge upon his trade new methods and new products provided, of course, they have been thoroughly proved and accepted by the leaders of the industry.

This is the type of dealer we want. And to such we can offer a proposition more attractive than any he has probably ever received.

The Gyproc Proposition

We do not regard the dealer as merely a customer. When he takes on the Gyproc agency he becomes one of us, an active part of a large and growing organization. Together, we both work to sell our real customers—which are the building trades and the general public. Material assistance such as newspaper and direct-mail advertising, even to paying 50% of the dealer's own advertising expenditure is provided.

This is only a brief outline of what YOU can obtain if you wish. More complete details will be gladly forwarded to you upon request.

The Ontario Gypsum Company, Ltd.

HEAD OFFICE: Paris, Ontario

Toronto Offices: 106 Don Esplanade. Windsor: 30 LaBelle Bldg. Montreal: 10 Cathcart St.

Factories: Caledonia, Ont. Lythmore, Ont.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

- Acid Proof Fans
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Aluminum
  - Spielman Agencies Regd.
- Architectural Iron
  - Canadian Welding Works
  - Northern Architectural Iron Works
  - Canada Wire & Iron Goods Co.
  - McGregor & McIntyre
  - Meldrum Iron Works Ltd.
- Air Hoists
  - Canadian Ingersoll-Rand Co.
  - Inglis Co., John
- Ash Hoists
  - Canada Link-Belt Co.
  - Jeffrey Manufacturing Co.
- Asphalt
  - Imperial Oil Company, Ltd.
- Beam Spans
  - Hamilton Bridge Works Co.
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Blast Hole Drills
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Blast Gates
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Block (Wire and Manila Rope)
  - Clyde Iron Works Sales Co.
  - Hopkins & Co., Ltd., F. H.
- Blowers and Compressors
  - Canadian Ingersoll Rand Co.
  - Canadian Blower and Forge Co.
  - Sturtevant, B. F. & Co.
- Bodies (Steel and Wood)
  - Wood Hydaulic Hoist & Body Co.
- Boilers
  - Canadian Ingersoll-Rand Co.
  - Engineering & Machine Works of Canada Ltd.
  - F. H. Hopkins & Co., Ltd.
  - Inglis Company, John
  - McGovern, T. J.
  - Mussens Limited
  - Waterous Engine Works Co.
- Boiler Inspection
  - Trades Labor Branch Dept. Public Works
- Boxes—Junction
  - Standard Underground Cable Co., of Canada Limited
- Box Rails
  - Midwest Canada, Limited
- Boxes (Valve)
  - Jenkins Bros. Ltd.
- Brick Dryers
  - Canadian Blower & Forge Co.
- Brick Machinery & Supplies
  - Hepburn, Ltd., John T.
- Bridges
  - Hamilton Bridge Works Co.
  - Standard Steel Construction Co.
- Bridges (Steel)
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Buckets
  - Canadian Austin Machinery
  - Link-Belt Limited
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Jeffrey Manufacturing Co.
  - Orton & Steinbrenner Co.
- Buckets (Clamshell)
  - Industrial Works
- Buckets, (Grab)
  - Industrial Works
- Building Materials
  - Brantford Sand & Gravel Co.
  - Britnell, Limited
  - Brompton Lumber & Mfg. Co.
  - Link-Belt Limited
  - Muldoon Ltd., J.
  - Oakley & Sons, Geo.
  - Rogers Supply Co.
  - Vitrified Clay Pipe Publicity Bureau
- Building (Steel)
  - Standard Steel Construction Co.
- Cable
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Mussens Limited
  - Standard Underground Cable Co., of Canada Ltd.
- Cars—Steel Body
  - F. H. Hopkins & Co., Ltd.
  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - Canadian Equipment Co.
- Cars Wheels
  - Canada Iron Foundries
- Carrier Systems
  - Jeffrey Manufacturing Co.
  - Link-Belt Limited
- Castings—Grey Iron
  - Canada Iron Foundries
  - Engineering & Machine Works of Canada Ltd.
  - Hepburn, Ltd., John T.
  - Inglis Co., John
- Cement
  - Britnell, Limited
  - Muldoon, Ltd., J.
- Cement Gun
  - Cement Gun Co.
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- Cement Hardener
  - Canada Cement Co.
  - Rogers Supply Co.
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- Cement Waterproofing
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
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  - Spielman Agencies Regd.
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- Chains
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- Clamshell Buckets
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- Coal Crushers
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- Coal Handling Apparatus
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- Concrete Block Machinery
  - London Concrete Machry. Co.
- Concrete Carts
  - Canadian Welding Works
  - F. H. Hopkins & Co., Ltd.
  - London Concrete Machry. Co.
- Concrete Culvert Pipes
  - Dominion Concrete Company
- Concrete Machinery
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Koehring Co., of Canada
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  - Mussens Limited
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  - Hopkins & Co., Ltd., F. H.
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  - Mussens Limited
  - Turnbull & Co., Harvard
  - Wettlaufer Bros.
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  - Spielman Agencies Regd.
- Concrete Sewer Pipe
  - Dominion Concrete Company
- Concrete Tile
  - Winchester Cement Block & Tile Mfg. Co.
- Conduits
  - Conduits Company, Limited
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- Conduits (Wooden Pressure Creosoted
  - Pacific Coast Pipe Co.
- Contractors
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  - Kilmer & Barber
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  - Ball Engine Co.
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  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
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  - Eastern Equipment Co.
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  - Gartshore, John J.
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  - Osgood Company
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  - F. H. Hopkins & Co., Ltd.
  - Inglis Co., John
  - Mussens Limited
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- Core Drills
  - Canadian Ingersoll-Rand Co.
- Cranes (Crawling Traction)
  - Industrial Works
- Cranes, Travelling and Locomotive
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
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  - Crane Limited
  - Erie Steam Shovel Co.
  - Hopkins & Co., Ltd., F. H.
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  - Industrial Works
  - Koehring Co., of Canada
  - Link-Belt Limited
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Creosote Oils
  - Britnell, Limited
  - Dom. Tar & Chemical Co., Ltd.
- Crushed Stone and Granite
  - Canada Crushed Stone
  - Crushed Stone, Limited
  - Hagersville Crushed Stone Co.
  - Hagersville Quarries Ltd.
  - Muldoon, Ltd., J.
  - Rogers Supply Co.
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- Crushers (Stone and Rock)
  - Canadian Ingersoll Rand Co.
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  - Inglis Co., John
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- Cut Stone
  - Oakley & Sons, Geo.
- Damp Proof Coating
  - Barrett Company, Ltd.
  - Imperial Oil Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
- Derricks and Derrick Fittings
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Hepburn, Ltd., John T.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Turnbull & Co., Harvard
- Ditchers
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Mussens Limited
- Ditching Machines
  - Ball Engine Co.
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
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  - F. H. Hopkins & Co., Ltd.
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- Doors (High Grade)
  - Brompton Lumber & Mfg. Co.
  - Pannill Door Co.
  - Stewart, Robert
- Drag Line Excavators
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - F. H. Hopkins & Co., Ltd.
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  - Mussens Limited
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  - Canadian Blower & Forge Co.
- Dredges
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Drills
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co.
  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
  - Canadian Equipment Co.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

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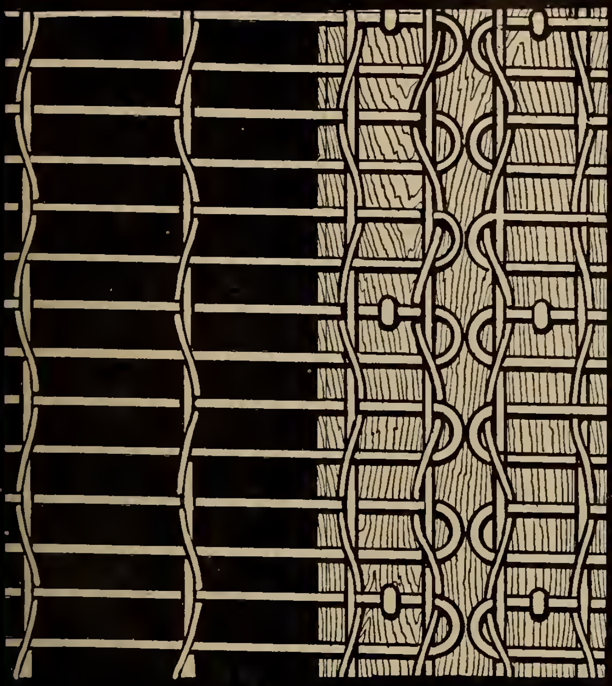

GREENING TRUSSED WIRE LATH

Definite Points of Superiority

Selvedge edge prevents cutting or scratching while handling; lathers can work faster.

"Truss" construction prevents buckling when lathe is unrolled. Lays flat. Requires no lacing at edges over studs and joists. Can be placed over sheathing without furring. The truss construction raises every other wire off the joist thus providing a perfect key to the plaster even at the joists.

Thoroughly embedded in the plaster and thus absolutely protected from corrosive effects of the atmosphere. Rust does not attack the rounded wire as it does the thin edge of sheet metal fabric.

Readily bent and formed into shape with minimum cutting. Stock width 32" and 36", rolls 105' long.

The B. Greening Wire Co., Limited
Hamilton, Ontario
Winnipeg, Man. Montreal, Que.

This Splendid Plant and Equipment FOR SALE

AIR COMPRESSORS

Item 4025	8	"Can-Ingersoll Rand" Compressors — 1053 cubic feet capacity—cross compound—belt driven.
Item 4026	5	"Sullivan" Compressors — 1100 cubic feet capacity — angle compound — belt driven.

BOILERS

Item 3000	2	Locomotive Type Boilers—60 H.P. on skids.

CHANNELLERS

Item 4024	14	"Sullivan" Type VW-61 Channellers—Duplex.

CONCRETE MIXERS

Item 3004	15	"Ransome" Mixers—1 cubic yard capacity, electric driven—on skids.
Item 3005	3	"London" Mixers—1 cubic yard capacity, electric driven on skids.

CONVEYORS

Item 9006	1	"Stephens - Adamson" Conveyor 702' centres—30 inch.
Item 9007	2	"Robins" Conveyors—600' centres—24 inch.

DRILLS

Item 4016	20	"Can-Ingersoll Rand" Submarine Drills —Type H66
Item 4017	40	"Sullivan" Tripod Drills—Type FP-3.
Item 4021	5	"Canadian Ingersoll Rand" Tripod Drills—Type LG54.
Item 4022	8	"Canadian Ingersoll Rand Tripod Drills—Type LG53¼.
Item 4018	50	"Sullivan" Hammer Drills—Type DP33.
Item 4019	10	"Canadian Ingersoll Rand" Jackhammers BCR-430.
Item 4020	15	"Canadian Ingersoll Rand" Jackhammers DDR-13.
Item 4023	12	"Oldham" Plug Drills—Type L.

HOISTS

Item 9196	2	"Mead Morrison" Electric Hoists—Double Drum—with 80 H.P. Motors.
Item 3007	6	"Marsh Engineering Works" Electric Hoists—Double Drum—with 75 H.P. Motors.
Item 9197	1	"Maine" Electric Hoist—Double Drums —with 37 H.P. Motor.

LOCOMOTIVES

Item 4005	1	"American" Saddle Tank—18 x 24 cyls. —57 Tons.
Item 4003	2	"Montreal Loco. Works" Saddle Tank —10" x 14" cylinders — 18 Tons — standard gauge.
Item 4002	2	"Pennsylvania" Switchers — 17" x 24" cyls.—40 Tons—with 8 wheel Tenders.
Item 3009	5	Electric Locomotives 500/600 volt D. C. —50 Tons.

SHOVELS

Item 4001	1	Model 60 "Marion"—2½ yd.—70 Tons.
Item 4000	1	Class C-45 Atlantic—2½ yd.—65 Tons.
Item 3011	2	Model 103C "Bucyrus" Electric—4½ yd.
Item 3012	3	Model 225B "Bucyrus" Electric 6-8 yd.

SNOW PLOW

Item 3013	1	"Can. Car & Fdry. Co." Standard R.R. Snow Plow.

TRACTORS

Item 3015	4	"Fordson" Gasoline Tractors complete.

We list above only a few of the interesting items we have available. We have an immense stock of Contractors' Tools and Accessories and will be glad to send our "Sales Inventory" upon request.

Hydro Salvage Syndicate

P. O. BOX 109, NIAGARA FALLS, ONT.

(operated by)

Canadian Equipment Co.
Limited
Montreal

F. H. Hopkins & Co.
Limited
Montreal — Toronto

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Electric Fans
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Electrical Specialties
Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

Elevators
Link-Belt Limited
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roi Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

Fans, Multiblade
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre

Fittings
Crane Limited

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Floor Clips
Western Steel Products Limited

Floor Stands
Jenkins Bros. Ltd.

Flooring Materials
Carmichael Ltd., A. W.
Imperial Oil Company, Ltd.
National Fireproofing Co.
Symmes & Co., H. H.
Vitrified Clay Pipe Publicity Bureau

Forges
Canadian Blower & Forge Co.

Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

Gasoline Engines
London Concrete Machry. Co.

Gravel
Allen Bros.
Brantford Sand & Gravel Co.
Rogers Supply Co.

Hammer Drills
Canadian Ingersoll-Rand Co.

Hardware
Hardware Co., of Toronto
Mercer Bros.

Hardwood Flooring
Brompton Lumber & Mfg. Co.
Eaton & Sons, J. R.

Hauling Contractors
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Link-Belt Limited
Clyde Iron Works Sales Co.

Hoists (Truck)
Wood Hydraulic Hoist & Body Co., Ltd.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Industrial Works
London Concrete Machry. Co.
Mussens Limited

Hoisting Engines
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
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Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Muldoon, Ltd., J.
Standard Lime Co.

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Link-Belt Limited
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

Locomotive Steam
Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

Oil Tanks
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Inglis Co., John
MacKinnon Steel Company

Orange Peel Buckets
F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

Ornamental Iron
Canada Wire & Irons Goods Co.
Dennis Wire & Iron Works Co.
Meldrum Iron Works Ltd.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Panels (Hardwood & Veneered)
Laminated Materials

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

Pencils((Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works
Greening Wire Co., B.

Pile Driving Machinery
Canadian Ingersoll-Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Co.

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.
Laurie & Lamb

Portable Loaders
Jeffrey Manufacturing Co.

Posts (Indicator)
Jenkins Bros. Ltd.

Power Engines
Inglis Co., John

Prisms
Luxfer Prism Co.

Propeller Fans
Sturtevant, B. F. & Co.

Pumps and Pumping Machinery
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Cook, A. D.
Fuller & Johnson Mfg. Co.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Waterous Engine Works Co.

Pump Valves
Jenkins Bros. Ltd.
Canadian Ingersoll-Rand Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

Portable Air Service

MAKE YOUR AIR WHERE YOU USE IT

Reports from contractors, public service companies, municipal and government departments are unanimous regarding the splendid results secured by adding one or more Ingersoll-Rand Portable Compressors to their field equipment.

Where maximum portability and rapid transportation are desirable the 5 x 5" Type 20 Compressor mounted on a standard Ford truck chassis is particularly useful.

This outfit has a capacity of 91 cu. ft. per minute and permits the extensive use of air-operated equipment on work lying over an extended area or on jobs of very short duration even though they are located a considerable distance apart. It is, therefore, widely used by telephone and power companies, structural steel fabricators, gas and water companies, contractors, etc.

You can buy the outfit complete mounted on the truck chassis or ready for mounting on your own truck. Standard outfit includes: compressor; gasoline engine or electric motor, cooling system, air receiver, fuel tank, tool boxes, mud guards and sheet steel covers.

Ingersoll-Rand Portable Compressors are also furnished with steel wheels; on rubber tired wood wheels; on rubber tired trailers or on skids.

We will gladly advise you regarding the type best adapted to your work.

Canadian Ingersoll-Rand Co., Ltd.

Sydney Sherbrooke Montreal Toronto
Winnipeg Nelson Vancouver

For the U. S. refer Ingersoll-Rand Co., 11 Broadway, N. Y.

Ingersoll-Rand

Drills Compressors, Oil Engines, Hoists, Pumps

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Railway Supplies
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Hopkins & Co., Ltd., F. H.

Reinforcements, Concrete & Steel
Burlington Steel Company
Canada Iron & Wire Works
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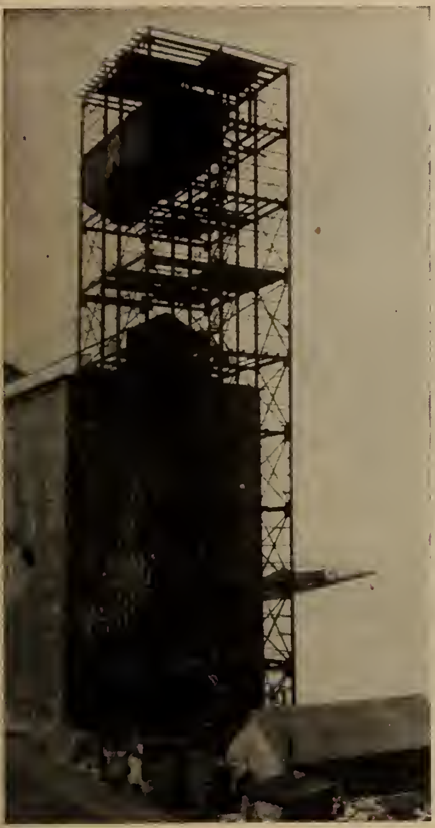

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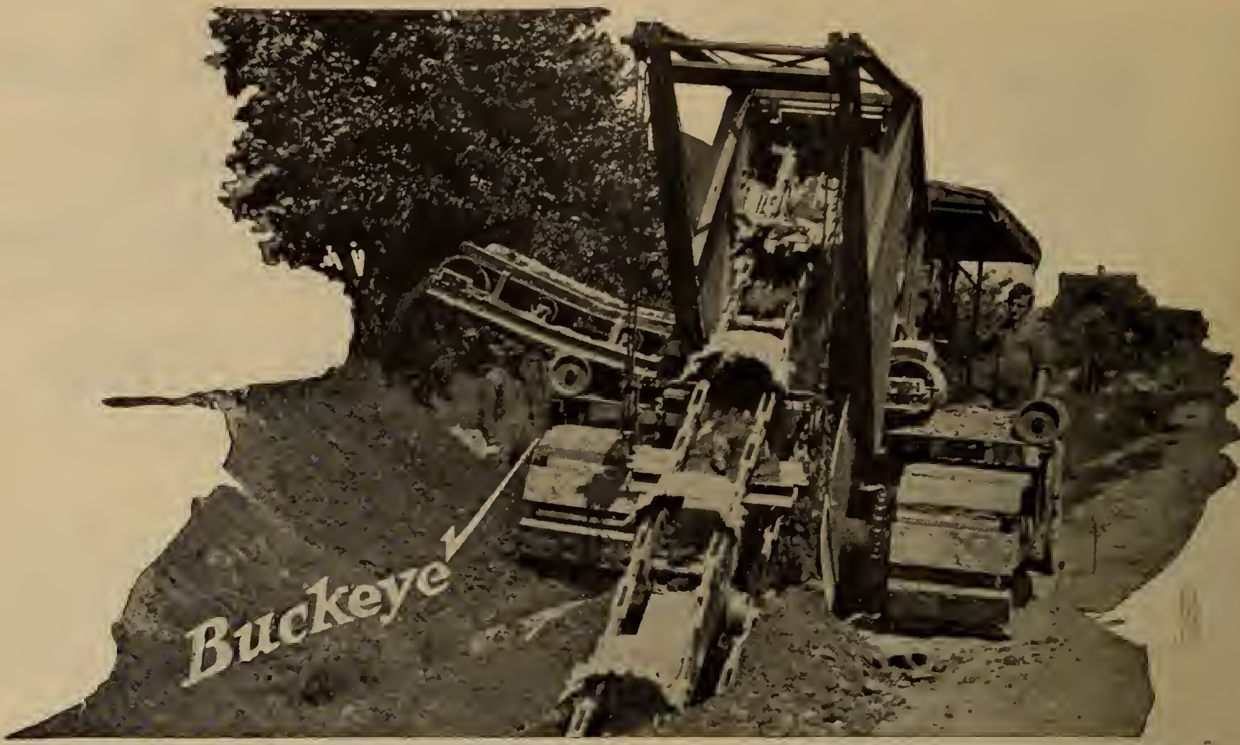

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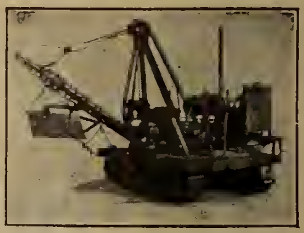

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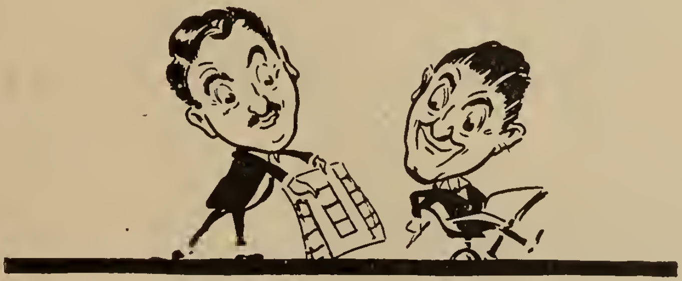

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DEPARTMENT OF LABOUR

BOILER INSPECTION NOTICE

Excerpt from Regulations for the Construction and Inspection of Boilers

Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

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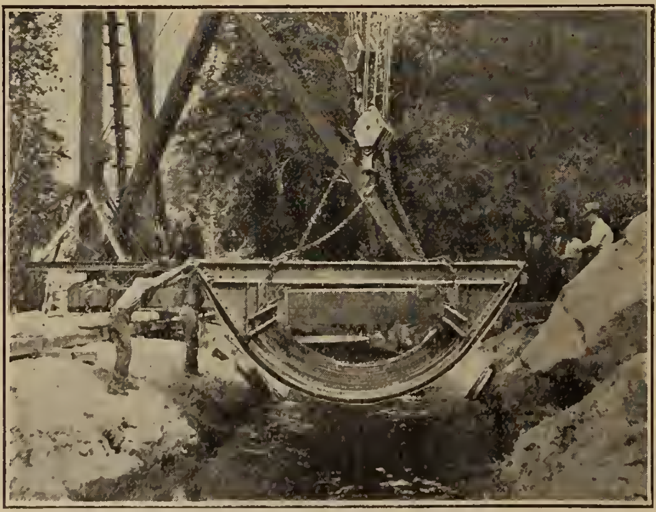

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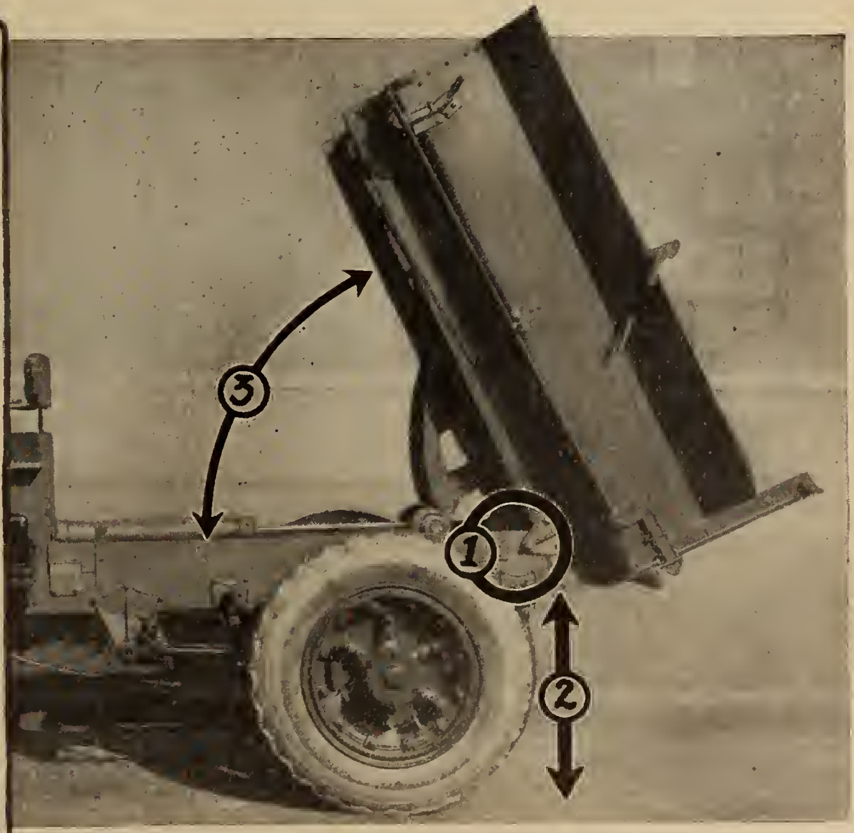

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Who is Responsible for High Building Costs?

In recent discussions of building costs the statement or implication has appeared in many publications, that Dr. John M. Gries, chief of the Division of Building and Housing, of the U. S. Department of Commerce, "after a careful survey of building conditions" gives it as his opinion that labor charges account for so small a proportion of the construction cost of the average house, that increases in labor wages have little bearing on total building costs. The articles in question then point out that as, according to the "survey," labor was only 26 per cent. of the cost of a house, a $5,000 house would only cost $650 less if there were a straight reduction of 50 per cent. in the wages of labor employed on it. One newspaper states that this is an answer to charges circulated freely by those "higher up" in the building, that exorbitant wages entering into the cost of construction are responsible for the high prices that are making tenants instead of home owners out of people of moderate means.

Some of the publications dealing with this subject have even gone so far as to imply that while the labor cost of a $5,000 house represents only 26 per cent. of the whole, the material cost amounts to 74 per cent. The general effect has been to convey the impression that the United States Department of Commerce sponsors the proposition that high building trade wages have little to do with the present cost of housing, and that the producers and purveyors of building materials are chiefly responsible for the situation.

It is interesting, therefore, as the National Lumber Manufacturers' Association points out, to ascertain exactly what Dr. Gries did say. It appears that a talk by Dr. Gries before officials of the Bureau of Standards was authentically reported in a Department release as follows:

> "Figures were given showing the relative importance of the different items of construction costs for a certain house. Of these, labor charges accounted for only 26 per cent.; materials cost 29.3 per cent.; land, 19 per cent.; contractor, 12.6 per cent.; financing, 6.7 per cent.; architect and real estate fees, 6.4 per cent. These figures show that it is not generally possible to blame one single factor, such as high labor or material costs, for high prices of houses. He said that while the daily wage of building tradesmen might seem high to a man employed all the year, they were not necessarily high when the seasonal character of the employment was considered. He said a substantial saving in labor costs could be realized if arrangements could be made for employment during a larger part of the year. He also said similar savings in costs of equipment and contractors' overhead could be effected by a more extended building season."

It will be observed that Dr. Gries took his percentages from a "certain house" and made no reference whatever to "a careful survey of building conditions." Neither did he say that this "certain house" was a $5,000 house. As a matter of fact, it was a $10,500 house, which is a different matter. It is also to be noted that in the 100 per cent. of this house the price of the land is included, and also cost of financing and the architect and real estate commission fees.

As the National Lumber Manufacturers Association points out, the circulators of the idea that labor costs in the erection of a building are so small a part of the whole that it makes very little difference whether labor receives a large percentage increase or not, omitted to notice that precisely the same line of reasoning with different premises abstracted from Dr. Gries' statement, would prove that it makes relatively little difference whether materials cost much more or less. If the materials are only 29 per cent. of the cost of a $5,000 house, or $1,450, an increase of 10 per cent. in the price of materials will represent an increase of only $145 in the whole house bill, which relatively is next to nothing.

Dr. Gries' statement made it very plain that there are other factors in building costs besides those of labor and materials, which cannot rightfully be charged to either. In fact, the other factors in the case of the particular house he had in mind amounted to almost as much as the sum of materials and labor. In view of that situation he was merely rationally

No. 105

Canada's Engineers—A. L. Harkness

Announcement was made last week of the appointment of A. L. Harkness, B.A.Sc., as chief engineer of the Robert W. Hunt & Company, Limited, Engineers, with headquarters at Montreal. Mr. Harkness graduated in civil engineering from the School of Practical Science, Toronto, in 1906, and received the degree of B.A.Sc. from the University of Toronto in 1908.

After a number of years engagement with the Dominion Bridge Company, Montreal, as draughtsman, structural designer and estimator, he was in 1911 transferred to the designing staff of the St. Lawrence Bridge Company, Montreal, on the design of the Quebec bridge, and in August, 1914, was promoted to assistant engineer which position he successfully held until the completion of that contract. In September Mr. Harkness joined the firm of Essellstyn, Murphy & Hanford, Detroit, Mich., on the design of the reinforced concrete subway approach to the Belle Isle Bridge. A few months later he became associated with Smith, Hinchman & Grylls, Detroit, Mich., designing the structural steel for the Marysville power house of the Detroit Edison Co., also designing structural framework of other buildings in both reinforced concrete and steel. He was then with an engineering firm placing orders and supervising shipments of materials for a large power house for the Shanghai Municipal Council, Shanghai, China, and in March, 1921, joined Ross & Macdonald, architects, Montreal, as structural designer, later going to the Canadian Concrete Steel Co., in connection with the design of the reinforced concrete frames for the McGill medical building and the Rosemount apartments, also making preliminary designs and estimates for other buildings. Mr. Harkness was then successively employed by H. C. Johnston & Co., and John S. Metcalfe Co., engineers and contractors, and from May 1923 to the present has been checking the reinforced concrete design and supervising the construction of the Drummond Court apartments, Montreal.

Mr. A. L. Harkness

Mr. Harkness is an associate member of the Engineering Institute of Canada and a member of the Corporation of Professional Engineers of Quebec.

pointing out that little relief from the high cost of building could be expected from reductions in any one factor—the thought being that relief, if any, must come from an all-round reduction of building costs. The validity of this view is illustrated by the recent experience in many cities of a reduction in the cost of materials being quickly absorbed by an increase in the cost of labor.

Dr. Gries remarks that exaggerations by contractors and material men on the one side and labor on the other, of the costs chargeable on the other side in building, are harmful to both.

The Week's Developments in a Nutshell

There has never been a time when industrialists were more evenly divided as to the developments of the near future. It is an even vote whether the next move will be for the better or the worse. In the building industry prices are marking time with only such concessions as are governed by local conditions or forced by competition. There is very little unemployment but labor in the main is acting well. In general, the buying is for immediate needs only and following the same cautious course, manufacturers are not building up big stocks. This condition provides a very solid foundation for future operations.

A condition that appears to be developing in the financial world may have an important bearing on the construction industry. It is now almost unanimously agreed that money rates are due for a continuous fall—over a period of years. This, it is argued, will mean lower commodity and material prices. In addition to that, however, it will also be a considerable incentive to the private company or individual to build.

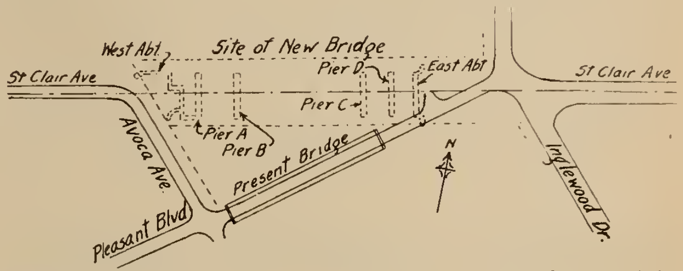
A prominent manufacturer sizes the general situation this way: "The future will be a contest of efficiency. There will be business but the profits will not be large. There will be a heavy mortality among the incapables. There's a good time ahead for the man of brains and energy."

Work Starts on St. Clair Ave. Bridge, Toronto

Steel Arch Structure Will Give Access to Rapidly Developing Section of the City—Main Arch Span Will be 260 ft.—Total Width will be 86 ft. with 64½ ft. Roadway

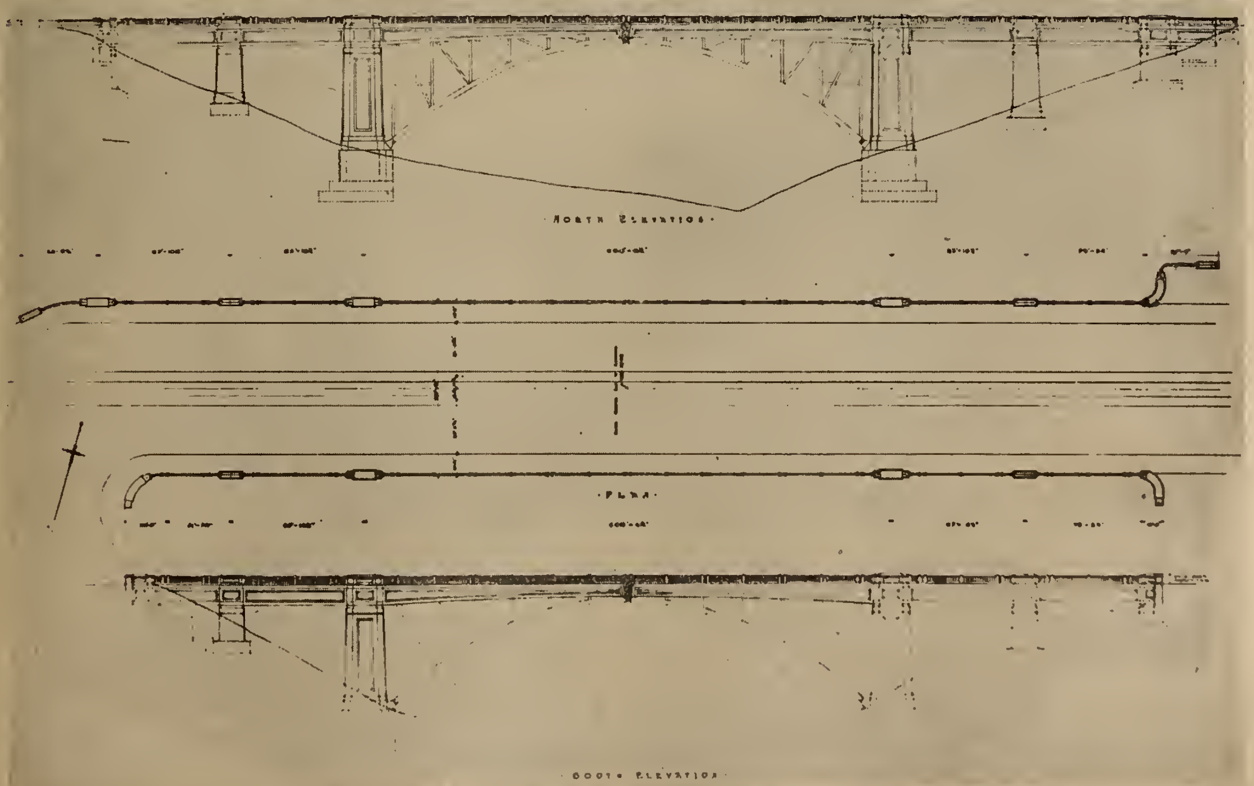
Last week excavation for one of the piers of the Avoca Vale bridge, Toronto, was started by the general contractors, Russell Construction Co. Ltd. This bridge is one that has been urged for several years and will, when completed, span the Avoca Vale or Reservoir ravine and link up in a direct line the two portions of St. Clair Ave. now separated by that gully. The portion of Toronto east of the ravine is known as Moore Park and for a number of years access to this locality from the west has been obtained by a bridge known as the Moore Park bridge, over the Vale of Avoca, a short distance south of the new bridge site. As will be seen from the accompanying location map, at the present time St. Clair Avenue ends at the ravine and traffic must go by way of Avoca Avenue over the Moore Park bridge to reach the extension at the avenue east of the vale. With the growing importance of St. Clair Avenue, however, and on account of the need for providing transportation by a direct route to Moore Park, the new bridge has been advocated for a number of years. This year the consent of the ratepayers was obtained and the plans were forthwith prepared and the contract let to the Russell Construction Co., Harbour Administration Building, Toronto. Upon its completion, the old Moore Park bridge, which has become inadequate for heavy traffic, will be dismantled.

The new bridge will be a 3-hinge, 4-rib steel arch of 260 ft. 6½ in. span and four girder spans, three of which are 65 ft. 10½ in. and one 58 ft. 3¼ in. These distances are from centre to centre of piers and not the clear spans. The piers will be of mass concrete up to the skewbacks and reinforced hollow concrete above. The abutments will also be of concrete, the west one being at a skew owing to the contour of the ravine at that point. All piers and abutments will rest on firm clay. The deck will be 86 ft. in width from out to out of handrails, providing two 10 ft. 9 in. sidewalks and a 64 ft. 6 in. roadway, including railway track allowance. A heavy concrete parapet wall and handrail will surmount the structure.

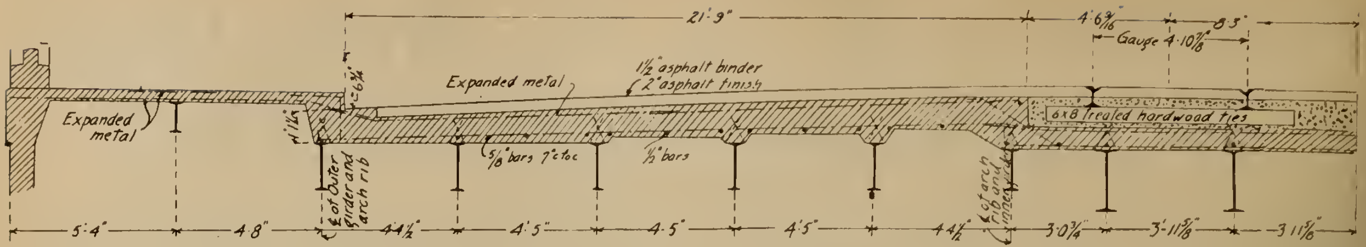


Location plan showing relation of new St. Clair Ave. bridge to existing bridge and to neighboring thoroughfares

The steel work, which is now in the process of being detailed, will comprise four arch ribs with the



Elevations and deck plans of St. Clair Ave. bridge, Toronto



Half-section of the deck of the St. Clair Ave. bridge

regular beam and girder floor system. The deck will be of reinforced concrete surfaced with asphalt finish. The sidewalks, which are cantilevered, will be of concrete, 4 in. in depth reinforced with expanded metal.

As mentioned before, the Russell Construction Co. Ltd. are the general contractors. Steel work will be erected by the Canadian Bridge Co., of Walkerville, Ont. The design was prepared by the Railway and Bridge Section of the Department of Works, of Toronto, of which Thos. Taylor is engineer and J. S. Burgoyne, assistant engineer. R. C. Harris is commissioner of works and G. G. Powell, deputy city engineer.

Hon. Mr. Henry Outlines Ontario Road Policy

His Address Before the Toronto Branch of the E. I. C. Gives Some Indication of the Principles To be Followed

At a meeting of the Toronto branch of the Engineering Institute of Canada, held in the Mining Building of the University, on Thursday evening, October 25, 1923, Hon. Geo. S. Henry, minister of public works and highways of Ontario, addressed the members on "The Highways of Ontario."

Before taking up the main theme, Mr. Henry ventured some opinions on the engineering profession, emphasizing the fact that the engineer should specialize in order to be a success. He said that the engineering profession in this country had great opportunities ahead of it and that the various communities should be proud of the men who are doing the work for them. "Other interests," he said, "are working with the engineer, namely, the employer and the artisan. All are necessary elements and when working harmoniously together and each giving due credit to the other interest, we get satisfactory results. To the engineers themselves I think I can safely say that they will be more successful individually if they specialize along some particular line. It is necessary for one to make a success in his calling after he has decided which line of activity he would like to follow and lay stress on that and not entirely neglect the others, but in this country the man who specializes usually makes the greatest headway in the long run."

Engineers, according to Mr. Henry, do not take the public into their confidence as much as they should, and he illustrated as an example, the Toronto railway viaduct question. He said that the engineers who are in a position to know refuse to say anything about it. Also that they are not giving assistance to solve the various problems which arise. Business men and municipal men are trying to solve these things, while the engineer is sitting back in his shell, while the public has the right to know what is going on.

The Highway Problems of Ontario

Mr. Henry then took up the main topic of his address — the highway situation — prefacing his remarks with same reference to his close connection with the keen interest in road problems over a large number of years.

"You will all appreciate, as engineers," he said, "the wonderful change that has taken place in road construction in the last ten years. Sentiment regarding roads has changed too and I want to say just a few words as to the relative needs of the different types of roads in this province. There is an impression that we ought to immediately grade all roads to a uniform width and build them to a uniform type, just as we started out to build a uniform type for the whole Toronto-Hamilton highway. This can only be done where the traffic warrants it, and where, if it were possible, one could build a road for all time. But since it is almost impossible to anticipate the needs of the future, great changes may come within the next 25 years. Consequently, you must appreciate as engineers that it would be folly to build a cement or asphalt road to take care of only a few vehicles per day, and yet the public are really beginning to think that we ought to do that along certain lines. It is not going to be economy for us to build roads not knowing what our requirements are going to be for the next few years. It depends on the traffic and the character of the traffic that the road is to carry. The right idea is to build roads that will be serviceable and efficient for the present and scrap or modify them by small expense when conditions warrant.

"We are educating the counties and encouraging them to build a standard type of road where the traffic requires it. The logical course is to build roads of a good type and construct pavements to a reasonable distance where the traffic gradually develops and shows itself. All our centres have a right to demand a higher type of road immediately adjoining them and the policy pursued by the recent government of building out from the centre and gradually hitching up one centre with another as required was the right one.

"In the three years, 1920-21-22, the province gave to counties and townships something like 13 millions of dollars or over a million more than the province received from the motor licenses in the same three years. Some people are of the impression that motor licenses are paying for the roads in the province. As far as revenue is concerned every dollar we have spent on the provincial highways has been produced from bonds sold at different years of repayment. There has been some discussion with regard to capitalizing the motor license, and if two millions were set aside annually, it would retire all the money that has been spent on the provincial highways in some twenty or twenty-five years—if we had the two million dollars, but we haven't got it. We have not had sufficient income from motor licenses to supply us with funds to assist the townships and counties in the maintenance of their roads.

"I am going to endeavor to enlist the counties in a forward movement to build a higher type of road and come up closely to the standard that the province has been adopting. The traffic does not demand it on some of the county roads, but I know of one case where the county is paying 20% to maintain a gravel road and in that same county, the county itself is building a penetration road of a high type. Do not go away with the idea, therefore, that all the important roads are in the provincial system. Some of them are in the hands of the counties. All they need is a little encouragement to get them to put in a higher class of construction and reduce their maintenance charges and they will solve the problem of giving better roads to the people of their county.

"I have had to look to you, as a profession, for a great deal of assistance in the development of the system. You should take more than a passing interest in the problems that confront a young country such as we have in Canada. The men who take an active part and give a portion of their time at least to the study of these problems, are the men that are worth while and we need such men and I think it is not too much to expect that we will get it from the men who have been given special opportunities. We, in a young country, must depend on ourselves, but each should give of his time to the solution of our problems and as I have suggested it will only be when you get out of your shell, and you give of your time for the public good."

Apparent Gains Are Often Hidden Losses

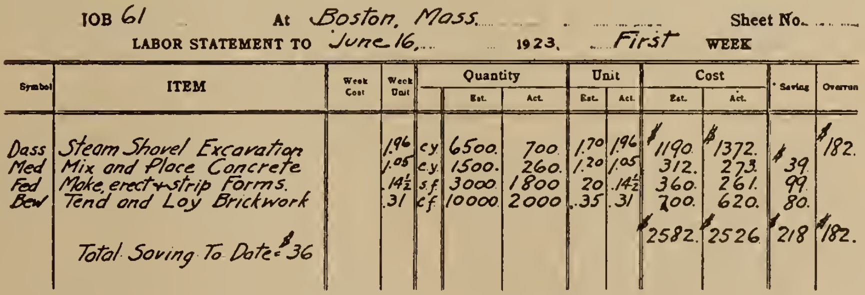
Danger Signals for Cost Accounts

How Construction Cost May be Safeguarded by Graphic Forecasts of Gain and Loss

By MORTON C. TUTTLE CO., Contractors, Boston, Mass.

Of its methods of analyzed cost accounting, Canadian and American industry is rightfully proud. Such accounting offers the only really sound basis for establishing prices; it is fundamental to assured knowledge of the development of profit or losses in any completed undertaking, or series of undertakings; and it furnishes the data without which estimates as to the outcome of future undertakings are no better than fortunate or, as the case may be, unfortunate guesses.

Yet most industrial cost systems, however painstakingly exact in their analyzed compilations, are weak in at least one important particular: they offer only historical information—they tell only what has occurred. They are, in short, a good deal like an autopsy, in that their revelations, while perhaps valuable for future guidance, are of no avail for remedying the immediate lugubrious situation.



JOB 61 At Boston, Mass. Sheet No.

LABOR STATEMENT TO June 16, 1923, First WEEK

Symbol	ITEM	Week Cost	Week Unit	Quantity			Unit		Cost		Saving	Overrun
					Est.	Act.	Est.	Act.	Est.	Act.		
Dass	Steam Shovel Excavation		1.96	c.y.	6500.	700.	1.70	1.96	$1190.	$1372.		$182.
Med	Mix and Place Concrete		1.05	c.y.	1500.	260.	1.20	1.05	312.	273.	$39.	
Fed	Make, erect + strip Forms.		.14½	s.f.	3000.	1800	20	.14½	360.	261.	99.	
Bew	Tend and Lay Brickwork		.31	c.f.	10000	2000	.35	.31	700.	620.	80.	
	Total Saving To Date = $36								$2582.	$2526	$218	$182.

Fig. 1—A weekly statement as it would ordinarily be rendered to show construction labor costs

It seems, therefore, high time to consider another forward step in accounting progress—that of so handling cost statistics as to make them serve not only as history but as really reliable prophecy. Not so much cost keeping as cost-tendency keeping is the need of the hour.

Cost-tendency keeping should eliminate the regrets inherent in cost accounting as now usually conducted, for its application should mean that, even while work is in progress, the true financial status of each operation will, at all times, be in evidence, so that bad costs may be corrected and good costs improved from the moment when they begin to appear. The importance of this calls for no demonstration; no proof is required in support of the contention that the actual soundness of any industrial enterprise is determined not by the costs of yesterday or of today, but by the ultimate loss or gain which an existing rate of expenditure, if continued, will entail.

Indispensable in Construction

As to just how far such a system is necessary, or even applicable, to highly standardized industrial undertakings it would not be safe to hazard opinion. But where important aspects of any product are constantly undergoing greater or less change—as in the manufacture of specialities—cost-tendency keeping offers an invaluable safeguard against losses. In building construction, where many operations are influenced by special local or temporal conditions, it is virtually indispensable; for, in construction, costkeeping gives instant warning of disorders in job costs which would, ordinarily, pass unnoticed because of their apparent insignificance. And because, oftentimes, high costs grow from little deviations, the system may often obviate calamity.

The system of cost-tendency keeping as it is practiced in the building operations conducted under our management is that of maintaining an extremely simple graphic chart—posted each week—whose indications are so clear as to be instantly comprehensive even by those to whom charts in general are anathema. A similar chart could, readily enough, be evolved by almost any factory accountant. Here, however, is an illustration of how it operates in the fulfillment of a construction contract:

Assume that work to be done consists of removing 6,500 cubic yards of earth, at an estimated labor cost of $1.70 per cubic yard; placing 1,500 cubic yards of concrete, at an estimated labor cost of $1.20 per cubic yard; laying 10,000 cubic feet of brick, at an estimated labor cost of 35 cents per cubic foot; erecting 3,000 square feet of form work, at a labor cost of 20 cents per square foot. These estimates will have been based on a careful study of previous cost records, modified by various allowances to meet peculiar conditions. The first statement of costs, rendered in the commonly accepted form, may very well stand as in Fig. 1.

Here is shown a net initial saving of $36 from the preliminary estimate of probable cost for the week's work. There does appear a single over-run—$182; but this is more than counterbalanced by other gains. Why worry?

Apparent Gains: Hidden Losses

In nine cases out of ten such a statement would be viewed in just that light—favorably rather than with foreboding. Yet if the same actual unit costs which appear in this statement should be allowed to continue, with a 26 cents over-run on each of the 6,500 cubic yards of excavation, the saving made in the operations of concrete placing, bricklaying and form work would, ere long, be overtaken and submerged by the loss for excavating. The finished job, instead of showing a proportionate increase in the first week's net gain of $36, would have developed a net loss of $900.

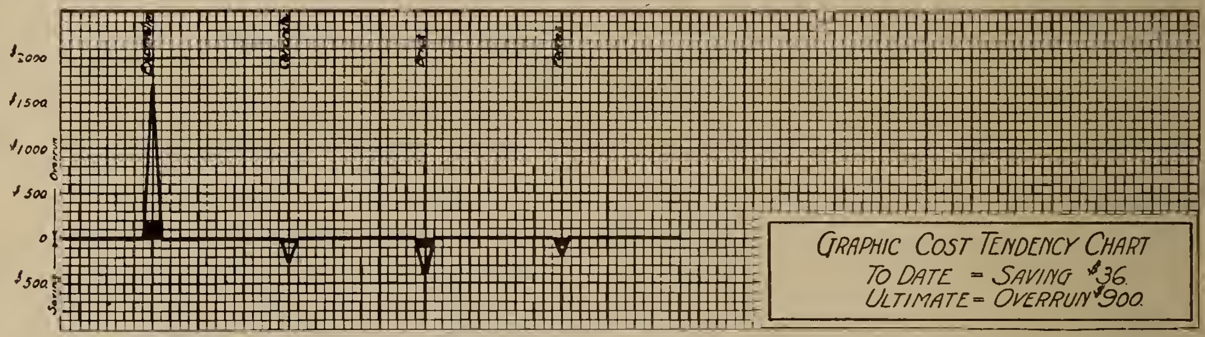


Fig. 2—Graphic statement of Fig. 1, so as to forecast the final outcome of the present rate of expenditures. The median line stands for the builders' estimate. Deviations to date in excess of the estimate are indicated by the level of the shaded portion of triangles show above this line. Deviations in the way of savings are similarly indicated below the line. The apex of the triangle in each case indicates ultimate loss or gain for the process involved.

The germ of that loss would have been industriously at work when the first statement was rendered. Closest scrutiny would have revealed it. But, since the keenest eye is occasionally a little dull, some method of mechanically precise and automatic magnification is more undeviatingly reliable. Such a method is afforded in the Cost-tendency Chart which, taking precisely the information rendered in the labor statement of Fig. 1, presents it both as history and as prophecy, since it shows what happened, what is happening, and what will happen in the end, if existing conditions do not undergo drastic change. (See Fig. 2.).

A Chart Easily Understood

In this chart the base line is the line of normalcy. It stands for the estimate. Of this line each process of construction controls its sector. As the work progresses and process after process is taken up and carried along if no deviation above or below the line appears, it is evident that everything is moving according to the estimate. That, of course, never happens. Points begin to develop above the line, indicating costs in excess of estimates; other points develop below the line, indicating costs lower than estimates.

More than this, these points are drawn as triangles enclosed by lines, within which the level of the shaded area shows the exact status of any process in terms of gain or loss at the time when the statement (chart) is rendered. The apex of the triangle shows what will be the total gain or loss for that process at the end of the job, if the present rate of expenditure continues without change.

Even the briefest examination of Fig. 2 is sufficient to demonstrate the effectiveness of this graphic method of presentation. It allows for no unfounded complacency. The executive who would experience a glow of satisfaction in perusing the formal statement of Fig. 1 could not, for even the briefest moment, escape the implications of the sky-scraping triangle which dominates Fig. 2.

Hammering the Points

His first concern would be to find a way to hammer down that menacing point. This would imply a systematic investigation of causes and the application of remedial measures. After that he would, probably, verify the accuracy of the glad tidings indicated by the lesser points below the chart lines, and would do his best to intensify every beneficial influence which he might find responsible for them.

Adequately forewarned by his cost-tendency charts, a competent building superintendent is in a fair way—barring the completely unforseeable—to dominate the costs of the operation in his charge. Without some such guide, he is, like a mariner without a compass, obliged to proceed largely by dead reckoning. He may come through safely, or he may suddenly find himself in a predicament from which he can extract himself only with serious losses.

In actual use, a cost-tendency chart for construction includes many more items than the few used for purposes of illustration in Fig. 2. Yet it is relatively quite as easy to follow. In Fig. 3 are presented three typical cost-tendency statements drawn from the cost records of a building operation precisely as it was carried through and precisely as its outcome was influenced by the heed given to the warnings of the soaring triangles of tendency.

This diagram presents a statement for each of three typical weeks of the same building operation: the third, the sixth, and the twenty-first. The third week shows the work well under way. Excavation by hand and by steam shovel is progressing smoothly and below estimated cost. Unloading steel has run a little above estimate; but the gang has worked better with the cement and has accomplished a saving.

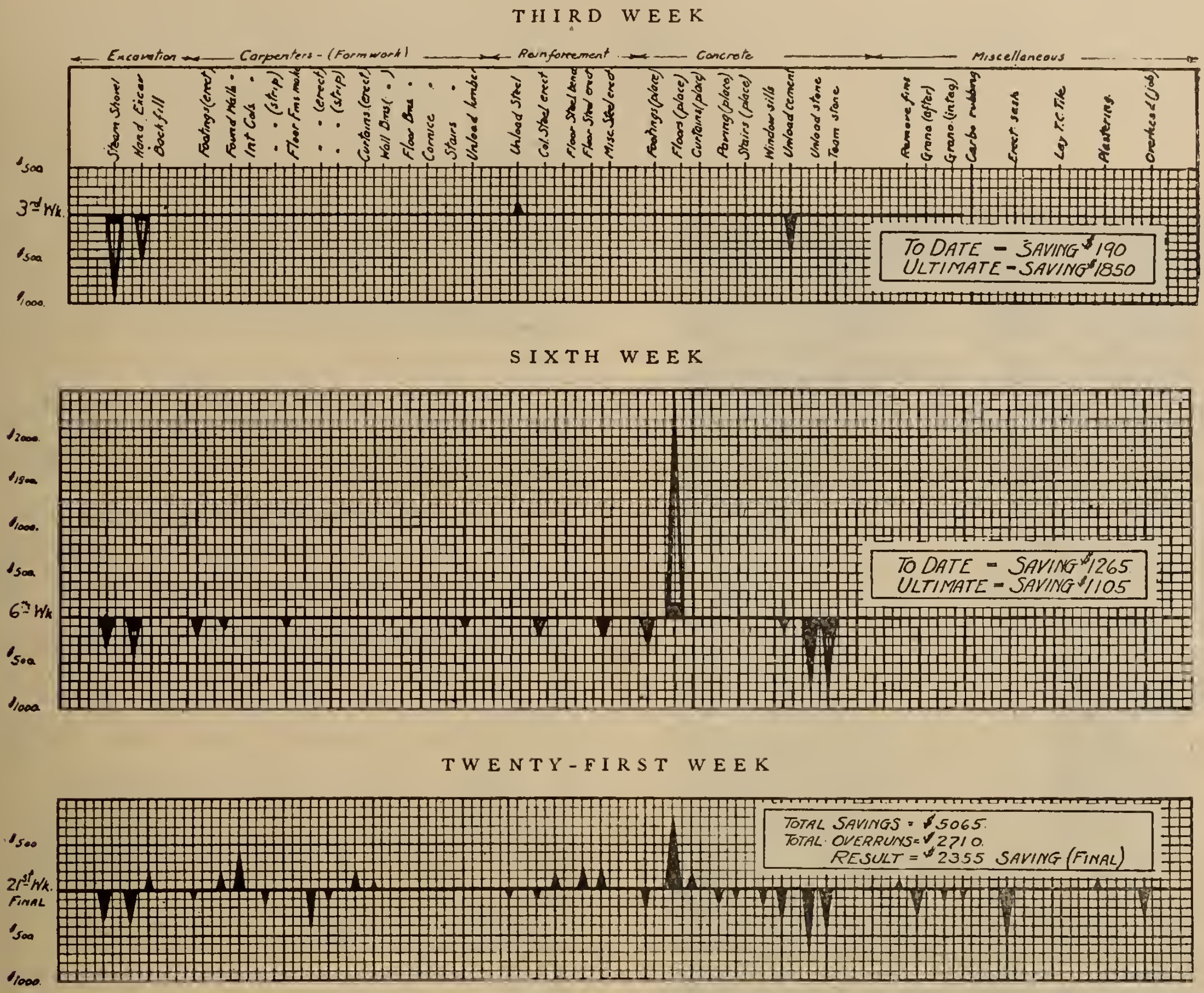


Fig. 3—From an actual construction enterprise. Three separate weeks of a twenty-one weeks program have been selected to show how fluctuations from the estimate will occur and how, by adequate forecasting, they may be controlled

The sixth week, however, suddenly uncovers trouble. Placing floor concrete begins badly. The quantity to be placed and the rate of expenditure both promise a troublesome over-run. Hammering down that point will become the centre of concern for everyone occupied with the job.

The end of the twenty-first, and last week shows the job complete and every triangle above and below the line finally and irrevocably filled with black. The threatening high point of the sixth week has yielded to hammering; but it has not entirely succumbed. Various other and small over-runs have occurred, and have been given each a monument. Excavation has not worked out quite so favorably as the third week's chart portended; but, all told, the savings aggregate $5,065 and the over-runs but $2,710. Hence, the final net saving is the very satisfactory sum of $2,355. That such an outcome could have been accomplished without the constant and timely guidance of a cost-tendency chart is very much more than doubtful.

Knowledge the Essence of Cost Control

The graphic cost-tendency chart here discussed is but one of the accounting devices used in our construction work to insure such mastery of every situation as a complete knowledge of facts makes possible. It is, however, perhaps the most important, as well as the most readily adaptable to other industrial requirements.

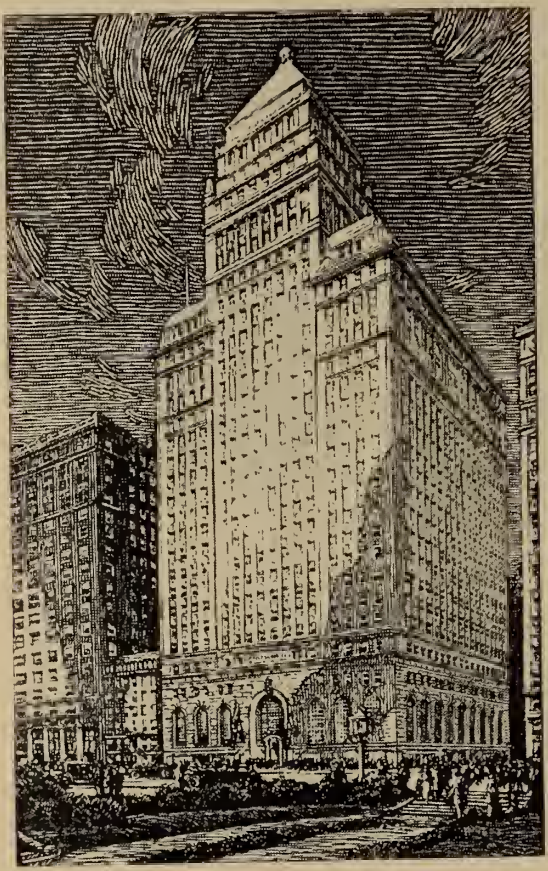
American Construction Council Meets

The first annual meeting of the American Construction Council, following the organization meeting that took place in Washington in June 1923, was held in New York City on Friday and Saturday, September 21st and 22nd, 1923. Among the problems discussed were local autonomy and national organization in the construction industry (how the American Construction Council should aid in the promotion of and co-operation with local building congresses); apprenticeship, vocational guidance and craftsmanship in the construction industry; reduction of unemployment in the contruction industry; the American Construction Council's program on research; and what the American Construction Council can do to help the various branches of the industry.

Conference Results in Lower Building Cost

Before the Straus Office Building was Erected in Chicago, a Conference of Officials Interested in the Structure Determined Upon Changes of Design that Decreased Cost and Increased Rentals

Building construction entered a new stage of development when after structural plans were completed for the $15,000,000 thirty-two story Straus building now being erected by S. W. Straus & Co. at the corner of Michigan Avenue and Jackson Boulevard, Chicago, a building conference was held in which the construction cost was cut approximately $250,000, while added service features were provided for the future tenants. The rentable area was also increased through the minor changes suggested by the foremost building owners and their technical advisors who made up the personnel of the conference.


The $15,000,000 Strauss building in course of erection in Chicago. This article tells how the cost was reduced after a round-table conference

Such a conference, the first of its kind ever held, is of greater significance because, notwithstanding the fact that S. W. Straus & Co. in making plans for its future home had the benefit of its own 41 years experience in the financing of building construction, and the experience of its architects, engineers and contractors, the Straus organization went one step further and determined to lay before the National Association of Building Owners and Managers the complete plans so as to benefit from the experience of men engaged in the highly technical profession of managing office building properties. Thus the Straus executives felt that it would bring to bear on the plans during their very inception the point of view of the future tenants.

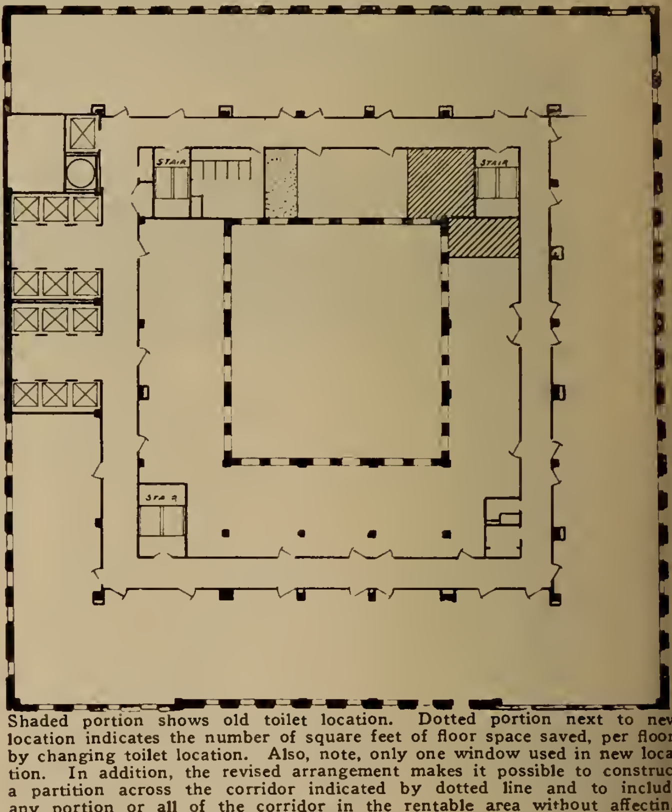
Even though no changes in the building plans would necessarily be made, the owners felt that bringing together of so many points of view would be highly profitable through the savings made by better and more efficient maintenance and operation.

The purpose of the gathering was the union of all those interested in the building, the owners, the architects, the engineers and the group of building managers, for the common purpose of determining the most artistic appearance, the greatest economy of construction and the most efficient layout of office space.

The Straus building furnished the first commission given the New Building Planning Service Committee of the National Association of Building Owners and Managers.

The Object of the Conference

The idea of the conference was to formulate better building construction and operation. And the precedent set in this commission of the committee will make possible like savings and better efficiency for not only office buildings but hotels, apartment hotels, apartment houses, warehouses and industrial plants.



Shaded portion shows old toilet location. Dotted portion next to new location indicates the number of square feet of floor space saved, per floor, by changing toilet location. Also, note, only one window used in new location. In addition, the revised arrangement makes it possible to construct a partition across the corridor indicated by dotted line and to include any portion or all of the corridor in the rentable area without affecting the accessibility to the toilet facilities.

Of equal significance is the fact that a financial house of the standing of S. W. Straus & Co., itself an authority on all types of construction, should have deemed it advisable to lay plans for its new home before the Building Planning Committee.

"This company," said Mr. S. J. T. Straus, senior vice-president of the Straus organization in discussing this interesting phase of the situation," is interested in every progressive development that has for its purpose the construction of better buildings.

"In analyzing a financial proposition, we are as much concerned with its ability to pay off interest and principal obligations as they mature through the income which it produces, as we are in the equity of the property. Therefore, in all of our financial operations, we pay special attention to the item of income, confident that if a property has an adequate earning power and the financing is properly handled, the loan is a good one."

"The co-operation of the office building managers," noted Earnest R. Graham, of Graham, Anderson, Probst & White, the architects for the new building, "has been long sought by progressive architects during the early stages in the development of large office building projects. The men engaged in this specialized field, during their years of experience, acquire much knowledge about the operating problems arising in the renting and maintenance of their buildings, and can, if given the opportunity, be of much service to the architect."

These comments on the conference show that all concerned were in a proper attitude of mind for effective co-operation. Both the owners and the architects recognized the value of expert advice from the building managers although they probably have far less need for such advice than do most owners and architects.

Rentable Space Increased

Despite the fact that the Straus organization was definitely committed to the steel design of the building and that no changes could be made which would effect the structural layout, the concentrated analysis of the experts resulted in a large number of constructive thoughts and suggestions relating not only to the material, the equipment and the layout of the building but also to considerations pertaining to the operation and renting program.

At this building conference it was voted that the plans as originally submitted to the conference were 100 per cent. perfect. The changes suggested by the members of the conference concerned largely those particulars which reflected the accumulated experience of the building managers representing the tenant point of view.

An example of the savings effected is the increase in rentable area through changes in the toilet facilities, elevator and court plans.

Instead of duplicating elevator door and signal equipment throghout the building, the corridor space between the elevator banks on all floors from the first to the thirteenth where express cars will stop is to be utilized for extra office space. On these floors there will be no elevator entrance doors or other expensive equipment. Above the thirteenth floor the elevator corridor space in front of the local elevators from the sixteenth to the twenty-first floor will be used for office space not previously planned. This arrangement together with the gains made by making the walls of the interior court perpendicular instead of terraced, will add $24,000 a year income to the building.

Other Big Savings

Another big savings was in the elimination of the chair rail, which has always been considered an essential for the protection of the walls from contact with chairs. As a matter of fact the chair rail does not protect the walls, because a chair usually makes a contact with the wall above or below the rail line. At thirty-five cents a linear foot, it can be appreciated the amount of the saving when it is realized that there are thousands of feet of wall in such a structure as the Straus building.

Among other savings effected are:

Elimination of sidewalk lights.

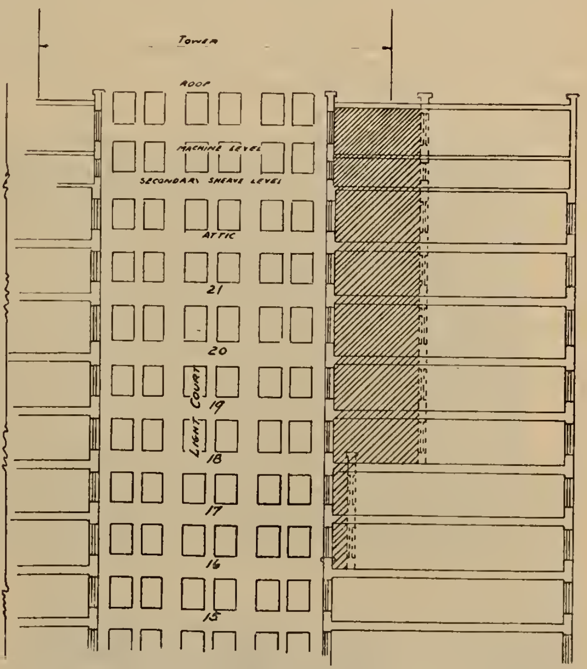
Elimination of locks on the inside office doors.

Elimination of exterior windows in elevator banks.

Elimination of one complete stack of toilets throughout the building.

Elimination of vacuum cleaning plant in favor of small portable machine.

Elimination of the setback in the court, which, at an expense of $50,000, enabled us to secure additional rentable area producing an annual income of approximately $25,000.



Showing additional gain in floor area by elimination of setbacks on south wall of light court

The new Straus building, which will be ready for occupancy prior to May 1, 1924, will be the largest structure on the Michigan Avenue skyline and will be one of the finest examples of office building architecture in the United States.

It will be a massive, towering structure of Bedford stone and will contain approximately 400,000 square feet of rentable office space exclusive of the six floors to be occupied by S. W. Straus & Co., the owners.

Following the best known examples of Florentine architecture the exterior of the structure will have a rusticated or deep joint treatment up to the sixth floor, above which there will be a plain ashlar finish with perpendicular lines emphasized to accentuate the height of the building thus giving it imposing stateliness.

Practical Pointers on How to Use Concrete in Winter Time

Structural Concrete Work Can be Carried on Safely in Cold Weather by Following Simple Precautions — Supplying Heat During Construction

By the Portland Cement Association

A distinct advantage is often gained by carrying on structural concrete work in the winter months. Construction work begun in the late summer or early fall may safely be continued throughout the winter. Builders and prospective owners need not hesitate to start construction during this period regardless of weather conditions.

Contractors have found that the cost of winter construction is from 3 to 10 per cent. greater than the same work would cost in summer, but certain advantages of winter construction frequently offset a part or even all of the additional cost so that the net results may prove an actual saving in construction. The material for the work can often be supplied in winter to the best advantage. Labor is more abundant and efficient and the project can be manned with the best of the labor market. There is also the important additional advantage to the owner of having the building ready for occupancy at an earlier date, as explained more fully in the paragraph immediately following.

Earlier Use of Structure

Frequently it is imperative to have a structure completed and ready for use at the earliest possible date. Schools, residences, apartment houses, office buildings and hotels are usually needed by a certain date. Earlier occupancy of such structures is of prime importance also from the investment standpoint.

Keenan Hotel, Fort Wayne, Ind. The 14-story reinforced concrete structural frame was built in the winter of 1922-1923, at the rate of one story in less than one week. By keeping five stories inclosed at one time the newly placed concrete was kept warm for about four weeks

Money provided for building construction earns nothing for the borrower until it is represented as an investment in a completed structure, either rented or occupied by the business for which it is intended. It is often penny-wise and pound-foolish to delay the construction of a needed concrete building because of cold weather, for the extra cost of construction in winter would often be more than offset by the interest saved on the money provided for its construction. The bonus or royalty often paid for the completion of a building before a specified time is tangible evidence of the value placed upon early occupancy by large corporations.

Placing Concrete in Cold Weather

1. The safest practice is to protect newly placed concrete as soon as possible, before it has time to freeze. There is no certainty that concrete that has been frozen even once will ever attain its full strength. Repeated freezing and thawing causes serious injury and may necessitate removal of the concrete. No freezing whatever should be permitted in concrete that will be subjected to abrasion, as in floors and pavements.
2. Heat the aggregates and mixing water so that the concrete when placed will have a temperature not lower than 65 degrees F.
3. Place the concrete in the forms immediately after mixing so that little heat will be lost.
4. Protect the concrete as soon as placed in order to retain the heat. Canvas covering, sheathing or a layer of clean straw will furnish sufficient protection for some work in mild weather. If the straw contains any manure, cover the concrete with a layer of tar paper, to prevent damage to the freshly placed concrete from acids in the manure. Where work can be inclosed, open coke stoves or salamanders may be used. In severe weather such protection and heating should be continued for at least five days.
5. The concrete must be strong enough to support all imposed loads before the forms are removed. Examine by pouring hot water on the concrete or by heating in some other way. Be sure the concrete has hardened, not merely frozen.
6. Concrete work can be placed as successfully in winter as in summer if the above rules are followed. Carelessness imposes its own penalties at all seasons of the year.

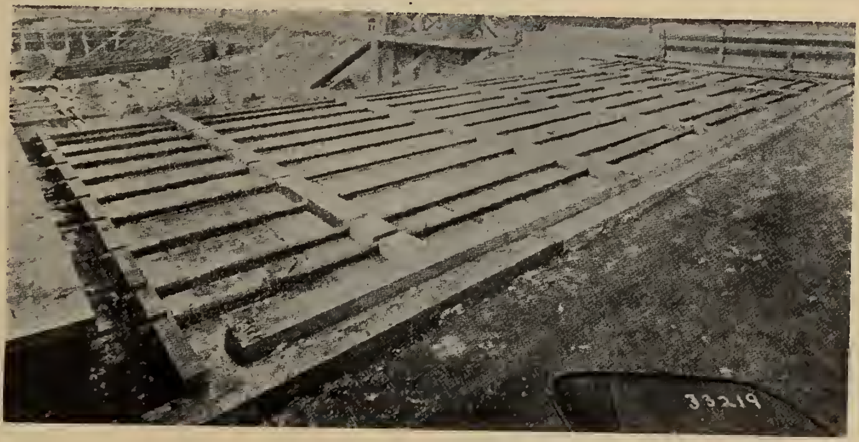
Fundamentals of Cold Weather Concreting

In order to place concrete successfully in cold weather, it is necessary to follow the methods and observe the precautions outlined in this booklet. The fundamentals of these methods are easily comprehended by an understanding of the action of concrete in hardening.

Hardening of concrete is not a process of drying out, as some people suppose, but is a chemical reaction between the cement and the water used in the mixing. Two things are necessary for proper hardening, namely, warmth and moisture.

Low temperatures will retard the hardening of concrete; extreme cold will prevent it altogether. Since water is necessary for the chemical action of hardening, evaporation of the water used in mixing the concrete must be prevented. This is often done by keeping the surface covered with wet sand, sawdust or burlap. As the temperature is lowered and the moisture content is reduced, the gain in strength and the entire hardening process become much slower and practically cease when the temperature of the water used in mixing falls to the freezing point.

There is no certainty that newly placed concrete that has been frozen even once, and has been thawed out and protected from further freezing until final hardening has taken place, will ever attain its full strength. The only safe practice is to protect freshly placed concrete as soon as possible, before it has time to freeze. If alternate freezing and thawing occur several times, the concrete will be seriously injured and may have to be removed. Concrete that will be subjected to abrasion, as in floors and pavements, should under no circumstances be allowed to freeze at all. The exact period that may be allowed to elapse between placing concrete and subjecting it to freezing temperature cannot be definitely stated because of the influence of unknown variations in temperatures and other conditions. Experience shows that this period should never be less than 48 hours, and if the outside temperature averages below freezing, 3 to 5 days should be allowed.



Special pipe grillage for heating aggregates. Loaded trucks of sand and gravel are dumped directly on to this platform. As soon as covered to a depth of 3 feet, steam is turned on continuously day and night. Grillage drips for condensation are shown on the left hand side. This installation produced an aggregate with a temperature of approximately 70 degrees at all times.

Methods for Winter Work

Since warmth and moisture are required for the proper hardening of concrete, cold weather work should be planned with those necessities in view. Both the mixing water and the aggregates should be heated. The cement forms but a small portion of the concrete and need not be heated, but it is well to keep it in a warm place for a few hours before it is used.

The nearer the temperature of the water is to the boiling point the better will be the results because it will take longer to dissipate the heat and cool the mixture. There are several types of water heaters that can be used, but the most common method of heating is to pass steam into the water tank. The concrete should be mixed with the least amount of water practicable to produce a workable, plastic mixture. An excess of water must be carefully avoided.

Many methods are used for heating aggregates. A simple method is to use a length of iron pipe, an old boiler, or any metal cylinder over which the sand, broken stone, or pebbles can be piled, and in which a fire can be built. Care must be taken to heat the fine and coarse aggregates separately in order to avoid pre-mixing them in wrong proportions. As this method entails rehandling the aggregate, and as the aggregates nearest the heater may be affected by excessive heat, the use of steam pipes is generally preferred.

Steam heating is a more expensive method and requires a steam boiler, but on large jobs this method is usually advantageous because the steam may also be used for other purposes. A practical method is to use a perforated steam pipe with a pointed end which can be worked into the piles of aggregates. To reduce loss of heat the piles of aggregates should be covered with tarpaulins.

If the materials are heated as above outlined, and the concrete is deposited immediately after mixing, its temperature when placed in the forms will be around 80 degrees F. and if care is taken to prevent too rapid loss of this contained heat, the concrete will harden properly. The early stages of hardening may be even more rapid than under ordinary conditions.

Heating the Forms

The forms must be free from snow, ice and frost, and should also, if possible, be reasonably warm, especially in the case of metal forms, which will absorb heat from the concrete rapidly. Live steam is an effective agent for cleaning ice and snow from the forms, and warming them. It should be used just before the concrete is placed.

Protection and Supplying Heat While Hardening

A rapid loss of contained heat must be prevented. Protect the concrete while hardening so as to maintain the warm, moist condition essential for the rapid development of strength. There are many methods of doing this: the most common is an inclosure of canvas or tarpaulins. In mild weather this alone may be sufficient, but when the temperature drops below the freezing point, some means should be provided for heating the enclosure. Steam escaping from perforated steam pipes around the concrete will give the best results, because the steam saturates the air and prevents evaporation of moisture from the concrete.

Coke salamanders or stoves are often used when steam is not available to supply warmth to the enclosure, but large pans of water should be placed over them in order to provide as much moisture in the air as possible. Care should be taken not to have these stoves or salamanders so close to the concrete as to dry it out in spots. An even temperature of at least 60 degrees F. should be maintained at all times in all parts of the enclosure. To maintain this temperature within a properly housed enclosure during cold weather, with good coke properly handled, one salamander will be required for every 300 to 500 square feet of floor area.

The most common practice is to build inclosures of tarpaulins, overlapped so as to prevent rapid escape of heat, about two stories being inclosed at one time. Undoubtedly a better method was the one followed in the winter of 1922-23 in the construction of the Keenan Hotel, a 14-story reinforced concrete building in Fort Wayne, Ind. As shown in Fig 1, five stories were inclosed at one time. This prolonged the length of time during which freshly placed concrete was kept warm and resulted in complete hardening before the protection was removed.

A more substantial form of protection is the complete wooden inclosure in our illustration of the Robertson-Cataract Electric Company. Complete inclosures necessarily cost more than temporary ones that protect only a few stories at a time. Their great advantage, however, consists in the fact that they protect the workmen of all trades and speed up the work from beginning to end. Furthermore, when once built they require no shifting.

Protective Coverings

When it is warm during the day with a temperature drop close to the freezing point at night, floors, pavements and foundations are often protected by covering with straw, hay or other material with satisfactory results, but such covering should not be relied upon during protracted low temperatures.

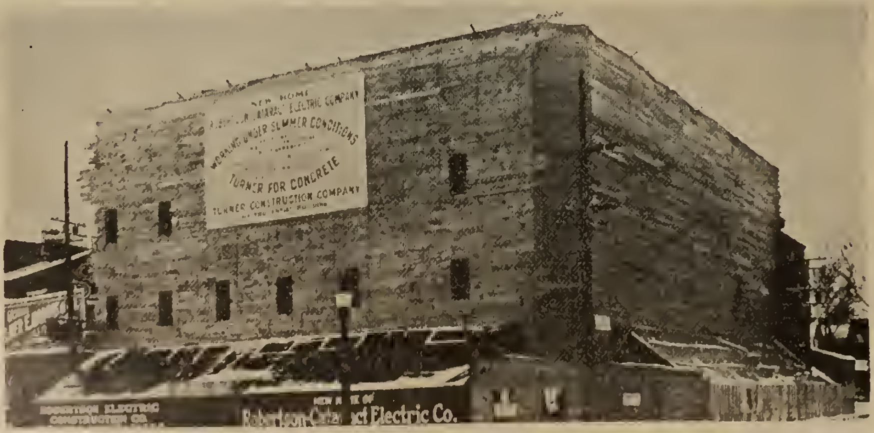
Even though the outdoor temperature may not drop to freezing, protection is necessary to prevent the concrete from losing the heat introduced by heating the materials, and insure proper hardening. At low temperatures the heat developed by the chemical reaction of the cement and water is too small to be safely relied upon except in large masses underground. Even in those cases the materials should be heated and the surface protected.

Thin structural members and floors have such a large surface area in proportion to their size that the heat within the concrete is dissipated rapidly, and therefore protection must be provided. Recent inspection of several concrete floors placed during the winter of 1922-1923 disclosed the fact that the top surface was inadequately protected after being placed. On one floor in particular it is known that the top

Practical Points for Cold Weather Work

From Instructions to Superintendents
By Turner Construction Company

1. Aggregates are heated to best advantage by 1½-inch steam pipes laid as a grill under the piles or by a 6-ft. length of perforated pipe insert, inserted into the pile.
2. Water is heated by running a 1½-inch steam pipe into the water barrel.
3. A 50-horsepower boiler, carrying 50 to 60 pounds of steam is required for a large job, but an 18 to 25-horsepower boiler is sufficient for jobs of not more than 5,000 square feet of floor area.
4. One salamander is usually sufficient for 300 square feet of floor area and a heat hole should be provided for each salamander. (See Page 10.)
5. Columns should be concreted the same as the floor and column tamping continued for an hour or more after the floor is concreted.
6. Bases of exterior columns are most difficult to protect and in extremely cold weather a salamander should be placed on two sides of exterior columns.
7. For unusual speed or cold weather or when monolithic walls are carried up, the lower floor should be curtained and salamanders placed at exterior columns.
8. Apply fuel to salamanders frequently and in small quantities to minimize smoke and provide uniform temperature.
9. Water barrels should be provided to extinguish fires and care taken to secure canvas against blowing against salamanders.
10. A detailed temperature record should be kept showing date, hour, outside temperature, temperature at bottoms of columns, underside of slab, under the canvas over the slab, temperature of concrete as deposited and, especially, temperature at bases of exterior columns on windward side of building.


NEW HOME
ROBERTSON-CATARACT ELECTRIC COMPANY
WORKING UNDER SUMMER CONDITIONS
TURNER FOR CONCRETE
TURNER CONSTRUCTION COMPANY
ROBERTSON ELECTRIC CONSTRUCTION CO.
NEW HOME OF
Robertson-Cataract Electric Co.

The Robertson-Cataract Electric Company's building in Buffalo was built in winter under summer temperature conditions. Complete inclosures, while costing more than temporary, movable ones, have the advantage of providing protection from the beginning to the completion of the work, for the workmen of all trades.

surface was placed during cold weather and no protection was provided. It was permitted to freeze almost immediately after it was placed, and it is probable that it froze and thawed several times before it hardened. The result was an unsatisfactory wearing course which in many places must be removed and replaced. Work of this kind should be protected with canvas, supported slightly above the surface, and with live steam forced under the canvas. The steam has the excellent characteristic of providing both heat and moisture, both essential in obtaining the best results in the hardening of concrete.

Use of Salt or Calcium Chloride

The practice of adding "anti-freezing" compounds such as sodium chloride (common salt) or calcium solutions to the concrete mixture is not generally recommended. Under no circumstances should they be depended upon to prevent freezing below 22 degrees Fahr., and they should never be considered substitutes for protection and heating.

Calcium chloride in quantity not exceeding 4 per cent., by weight, of the mixing water is a better anti-freezing agent than common salt. It accelerates the hardening of concrete to some extent, while salt retards hardening. Salt has a tendency to corrode reinforcing steel, and may cause efflorescence, which is unsightly on exposed surfaces.

Even if anti-freezing solutions are used, the aggregates and mixing water should be heated to remove ice or frost.

Application of Load

Too early removal of forms is always to be guarded against even during construction in favorable weather, and great caution should be observed in placing loads upon cold weather concrete. Especially is this true of walls, roofs and floors above ground, which carry loads other than their own weight.

Before removing forms the concrete should be examined to see that it has properly hardened and not frozen. A reliable test is to apply heat to the surface by means of a blow torch or a jet of hot water or steam against it. Frozen concrete will be dissolved by softening as it thaws out, but if properly hardened, the concrete will be unaffected by the application of heat.

How to Place Fire Stops in Dwellings

Manner of Reducing the Fire Hazard in Both Frame and Brick Types of Houses—The Methods are More Important than the Materials—Complete Fire-Stopping the Only Safeguard

By DUDLEY F. HOLTMAN
Construction Engineer, National Lumber Manufacturers Association

I am reminded of remarks made by Oscar Wilde, who at this particular time was a house guest. He informed his hostess in the morning that he had some work to do and asked that he be not disturbed. When he appeared at luncheon, his hostess asked him if he had had a profitable morning. Wilde replied, "Yes, I did. I inserted a comma in the poem I am working on. And I will be busy this afternoon." He did not appear until dinner. His hostess then asked him if his afternoon had been as profitable as his morning. Wilde replied, "It was, indeed. I spent the afternoon removing that comma."

Sometimes I feel as though we had reached the comma stage in style of house construction. We quibble about such details as a wrought iron lamp over the entrance or open lattice at the ends of a porch. Such additions, if appropriate to the style of the house, are pleasing and have due place and value. But stability in construction is so much more essential and especially that stability which takes care of risks and dangers. And we know that there is no greater risk nor danger of universal occurrence than **fire**. Fires not only break out from their own peculiar causes but we know that they are frequently a follow-up misfortune, as has been the case in the recent Japanese earthquake disaster. The astronomer, T. J. J. See, in summing up the earthquake situation in Japan, made the statement—"There is no relief for Japan except to build good houses and make them secure against fire."

Negligent Building

I previously have made the statement that fire-stopping in dwelling construction is as rare as a well-spent life. And there are many more dwellings which contain no evidence of fire-stopping details than there are persons willing to assume responsibility for the omission of those details. These inexpensive construction expedients which will help reduce the excessive toll of the fire loss to the country should be peculiarly worthy of study. And it is desired to emphasize at this point that it is just as essential that fire-stopping be employed in those houses whose exterior walls are built of masonry as those whose exterior walls are built of lumber. The lumber-built house adequately fire-stopped is a safer structure than the masonry walled house with no fire stops.

Fire stopping materials are numerous. Any material or combination of materials that will effectively accomplish the purpose of concealing open spaces in the walls or floors so that air cannot pass may be considered suitable fire-stopping material. Lumber fire stops, consisting usually of solid blocking, are economical, inexpensive, and easy to install. Incombustible fire-stopping materials, such as mineral wool, crushed mortar, plaster, concrete, hollow tile, or gypsum block may be used as dry fill. Loose boiler cinders form one of the best fire-stopping materials. A mixture of sand and gravel with cinders, ashes, or even dry earth, will likewise serve the purpose. The weight of sand or gravel alone would be objectionable if supported by metal lath and the same would be true of crushed concrete. An inexpensive fire-stopping may be provided by inserting a basket of wire netting covered with plastering.

Methods More Important Than Materials

It is not so much the material, however, as correct methods which I desire to emphasize. Those methods, which I am about to enumerate, will completely and effectively fire-stop not only the lumber-built house but, with very slight modifications, may be made to prevent the spread of fire in masonry veneered houses and masonry walled houses. For this reason, the lumber-built house will be discussed first.

There are three general types of lumber-built houses, those with framing known as balloon framing, those with framing known as western framing, and those with framing known as braced framing. Balloon framed buildings are those in which the supporting studs extend from the foundation to the eaves (a ribbon or ledger board let into the studs forms the support for the joists); western framed buildings are those in which the supporting studs extend from the top of each tier to the underside of the tier next above (the studs are provided with top plates and sole plates); and braced framed buildings are those in which solid corner posts extend from the foundation to the eaves with joists supported on heavy girts framed into the posts (the studs are cut in between the girts and heavy knee braces are provided at all corners at each floor level). Rigidity and strength are its outstanding characteristics but because of its cost it is not in common usage in present-day construction where speed and economy are likely to receive first consideration. The tendency, therefore, in most localities, is to displace the braced frame with either the balloon or the western type of framing.

Balloon-Frame Buildings

The exterior walls of balloon framed buildings should be fire-stopped at the sill and between the studs in the form of bracing placed at an angle of not less than 15 degrees nor more than 30 degrees from the horizontal to avoid possible openings due to shrinkage and at the same time to stiffen the frame. The last named detail is often called herringbone bracing. Where the ends of joists are supported on a ribbon let into the face of the studs, two fire stops are required. One should be between the studs to prevent vertical drafts and the other should be between the joists to prevent horizontal drafts from passing through ducts formed by the studding and the surfacings on each side. To further increase the value of this particular fire-stopping construction, it is only necessary to fill the spaces with loose incombustible material. The method of fire-stopping the partitions in this type of frame house consists of placing the fire stop at right angle to the joists.

Western-Framed and Braced

Western frame and braced frame construction, the other two types of frame construction, require very little fire-stopping. Where studs are set upon a sole, no fire-stopping at the floor line is required except that necessary between the joists to prevent horizontal drafts. A similar situation is encountered in the outside wall construction at the junction of the floors and walls.

The general principles of fire-stopping applicable to frame houses apply also to masonry veneered and masonry walled houses with the exception of slight differences necessitated by the open space between veneering and sheathing on the one hand and by the furring on exterior and interior masonry walls on the other. Joists which parallel masonry walls also require special treatment.

Masonry Construction

In the case of houses veneered with masonry, a space is generally left between the veneering and the sheathing of the frame wall. A fire within this space is an exceptionally difficult one to locate exactly. For this reason, the space between the veneering and the outside surface of the frame wall should be fire-stopped not only horizontally but also vertically, at intervals of at least three feet. The horizontal lumber strips will accumulate sufficient mortar droppings to act as an effective seal and perform fire-stopping functions satisfactorily. When the stops are set close together in this space a fire cannot spread over any considerable area, and the fire department need not wreck the entire wall to get at the center of action.

Where masonry walls are furred, the masonry between the ends of the lumber joists should project to the thickness of the furring beyond the inner face of the wall either the full depth of the joists or a double course above and below. Equally effective is the method which continues the inner face of the wall flush and places horizontal furring strips above and below the joists.

Where walls are studded off, as is sometimes done in a stairway in order to maintain a plane surface, the space between the inside face of the wall and the studding at the floor level should be fire-stopped with brickwork or other incombustible material.

In cases where beams or joists are parallel to masonry walls, there should be a space of at least two inches between such wall and the nearest joist. This space should be filled in solid with brickwork, concrete, or loose combustible material for the full depth of the joists.

These fire-stopping places which I have mentioned are not the only opportunities in house construction for protection against fire. There are fully as importont places in interior wall construction. Among these are openings at stairways, sliding doors, clothes chutes, and around pipes. Attention should also be called to the spaces between the attic and roof; back of or over porches; and between the basement, which houses the heating equipment, and the first floor.

Partial Fire-Stopping is Ineffective

I feel that there is no need on my part to convince my readers that fire-stopping is important. Rather, I wish to leave with you the belief that not only are representatives of the building public, who have to do with the design, with the construction, or with the inspection of dwelling construction, responsible for the lack of fire-stopping precautions in our dwellings but that each home builder or buyer should be as careful that these precautions have been taken as he is in the selection of garments which he inspects for imperfections. Second, that some such good method as I have mentioned is more important than the fire-stopping material. Third, all opportunities to fire-stop should be taken in order to make it complete. Partial fire-stopping is not much better than no fire-stopping. Full fire-stopping properly placed affords maximum security to those who dwell within and guarantees minimum damage in case of fire.

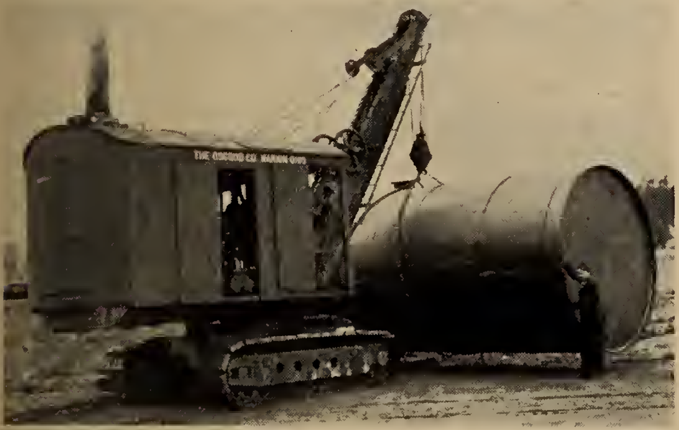
[Paper read before the International Fire Prevention Association Congress, New York.]

The Thew Shovel Co., Lorrain, Ohio, have issued folder 6-23, the second of a series on shovel performance. It is entitled "Weighing the Evidence" and illustrates and describes the numerous details of construction that are features of Thew steam shovels.

Hints for the Contractor

An Unusual Method of Moving a 15,000 Gal. Steel Storage Tank

A gasoline filling station, recently erected, offered quite a problem to the contractor. The station was to be equipped with a 15,000 gal. steel storage tank, but since the station was about one quarter mile from the nearest railway spur, the contractor was confronted with the necessity of finding some means of moving the tank that would be both cheap and quick. The size of the tank prohibited ordinary hauling as it weighed more than 5-½ tons, and was about 25 feet long and 9 feet in diameter.



Finally a nearby steam shovel, an Osgood "29," was secured for the job. The dipper and dipper handle were removed and a chain cradle, placed around the tank, was made fast to the sheave block. The steam shovel easily lifted the tank clear of the ground and with a man walking at either end of the tank to prevent undue swinging, it was carried across a field about ¼ mile and placed in a 12-ft. excavation. The entire operation required a total time less than one hour. The continuous treads of the shovel made movement across lots possible with a considerable saving in time.

An Inexpensive Method for Cleaning Road Cracks

An ingenious and inexpensive method for cleaning joints and cracks before filling with tar has been devised by a firm of contractors working on a concrete pavement.

The method referred to involves the use of a 30-foot length of ordinary ¾-inch rubber hose, provided with a ½-inch diameter gas pipe nozzle. The hose is attached to the exhaust pipe of the small motor truck used for hauling the tar kettle and other tools. The end of the gas pipe nozzle is drawn down to ¼ inch diameter. The crack or joint to be cleaned is first freed from any tightly packed dirt, by means of a metal "cleanout hook." The material thus loosened is then dislodged by directing the exhaust pressure of the motor, by means of the hose and nozzle, into the joint. The motor is speeded up to produce the necessary pressure at the nozzle. This simple method leaves a perfectly clean crevice. The exhaust gases, being warm, evaporate any moisture that may be present in the edges of the concrete, thus insuring a good bond between the concrete and the hot bituminous filler. The method is stated to be much quicker and more effective than the commonly used street broom, especially in getting rid of the fine dust which, if left in the crevices, may prevent the bitumen from adhering to the concrete.

Placing of Large Girder

The illustration herewith shows the placing of a 98-ton girder on the main line of the Boston & Albany Railroad, at Beacon St., Boston. This big girder

98-ton girder being placed by a large crane. The work was carried out between train schedules.

was received on flat cars, removed and held in suspension by a large "Industrial" crane. The work, which was done by the Phoenix Bridge Company, was carried out between train schedules, from about 10 p.m. until 1.55 a.m.

Contractors Not Represented at Labor Conference

In view of the importance of 8-hour day legislation to the construction industry, the Toronto Builders' Exchange have protested against the failure of the Hon. Mr. Murdock, Minister of Labor, to invite representatives of the construction industry to the Dominion and Provincial Labor Conference, held at Ottawa on September 26 and 27. A communication from the Builders' Exchange reads: "As representatives of labor and employers were called to this conference and no special mention made to the building employers, the Toronto Builders' Exchange, on behalf of the Provincial Builders' & Supply Association, made a plea for this industry to be represented. This request was not granted, as the Hon. Mr. Murdock stated that the only representatives invited were the delegates who had attended the labor conferences at Washington and Geneva. In view, however, of the importance of the questions discussed, we feel that the construction industry should have had representatives to participate in the deliberations."

Contract Procedure Protested by Toronto Builders' Exchange

A protest has been made to the board of control of Toronto by the Toronto Builders' Exchange regarding the acceptance of tenders for civic work, especially tenders that have been received in response to a second call for bids on the same work. They believe that such practice, particularly where in the second advertisement no change is made in the plans or specifications, leads to undesirable procedure on the part of bidders who can use the information and figures disclosed as a result of the first call. The objections are stated in the letter which is as follows:

Chairman,
Board of Control,
Toronto,

A letter was received by the secretary of the Builders' Exchange from your body, signed by W. A. Littlejohn, city clerk, calling our attention to a bylaw of the city council with reference to cash or marked cheque, which must accompany each tender for city work.

We have no objection to this by-law but we wish to call your attention to actions by the department of the city architect or the secretary of the board of control, who have recently passed on to your body recommendations for the acceptance of tenders not in accordance to the by-law referred to. We believe that no tender should be considered, no matter who the tenderer may be, without this rule being carried out to the letter. We further believe that if a contractor does submit a tender which is an infringement of the by-law this should not be considered but the next lowest formal tender accepted. We believe that the board of control asking for retendering based on exactly the same conditions as a first tender leaves the way open for men who are inefficient or incapable of knowing the value of a job to take advantage of published information when tenders are opened and to submit a price on the information so gained. This we believe is distinctly unfair to capable contractors who spend their time and money on this work, and fulfil the obligations of the by-law referred to.

We also believe that such an infringement of the by-law by any department or by your honorable body leads to suspicion regarding the action of contractors who are legitimately carrying out the functions of their business. We wish to protest emphatically against such suspicion or insinuation and state that it is the request of the writer, representing this body, that contractors for city work, who are respectable citizens and taxpayers, should be treated with consideration and not subjected to such insinuations by those charged with carrying out the instruction of your body.

Yours truly,
Toronto Builders' Exchange,
Per Geo. Gander, Secretary.

Building Prospects for 1924 in the U. S.

Willford I. King, well known economist, states in the American Contractor that in the business cycle we must look for a falling off after the high peak of building experienced early this year, and if building follows its normal course we must anticipate an irregular decline lasting well into 1924.

He concludes that the logical assumption is that during the next few years the country will normally erect for each "new inhabitant" buildings costing, at present prices, about $2,000, while each "old inhabitant" requires something less than $20 worth of building per year. This "new inhabitant" construction would require about two and three-quarters billions of dollars worth of construction yearly. If we allow a billion and three-quarters for the "old inhabitants," we arrive at a normal program of nearly four and a half billions per annum, or only a little less than the 1922 figure. It appears then that four billions per annum is a conservative estimate as to the normal consumption prospects for the next few years. Even though activity in 1924 may be somewhat below normal, the outlook for the building industry during the next three or four years appears to be distinctly encouraging.

The kind of buildings to be erected in the future are also of importance. Babson, for example, states that of the 170,000 dwellings built during the past two years, at least 75 per cent have cost over $6,000 including the land. This means that three-quarters of the new houses built are within reach of only about 10 per cent of the prospective buyers and renters. That 10 per cent has an average income of about $2,500 per annum. Hence the main problem of the residential building industry today is a matter of price. For each 10 per cent that the cost of a building can be reduced, the field of prospective customers will be increased by 500,000 to 1,000,000 people.

Compensation for Breach of Contract

Because Wilfrid Lajeunesse failed to deliver certain building materials which he had sold to Remi Gervais of St. Hyacinthe, P. Q., the latter was awarded damages on October 3 in the sum of $119.85 with interest as from June 18, 1917. The award was made by Mr. Justice Surveyer in the Superior Court of Quebec.

Gervais alleged that on December 4, 1916, he bought certain building materials from Lajeunesse, including a large number of doors, pipes and lumber, obtained from the demolition of local buildings, for which he agreed to pay $226.50. On December 15 Gervais paid $125 on account of this purchase, and on January 5 following he took delivery of part of the material, but found that some of it was not what he ordered. Gervais rejected what was unsuitable, and not up to specifications. Later Lajeunesse sent Gervais a cheque for $19.95 representing the difference between the amount the latter had paid and the price of the material actually delivered.

Failing delivery of the balance of the material bought, Gervais sued for loss occasioned through being obliged to buy material elsewhere, and also for loss of rent due to delay in the completion of a building at St. Hyacinthe. Lajeunesse pleaded that the contract of sale between him and Gervais had been conditional. The contract was modified by a condition, he alleged, founded on the custom of the trade, that delivery was to be contingent upon his ability to obtain the material through the demolition of buildings.

Mr. Justice Surveyer declared in his judgment that it had been established by a disinterested witness that the sale had been unconditional, and the defendand had not sworn that he had imposed this condition upon the plaintiff. The judge also dismissed the contention of the defence that the plaintiff had acquiesced in breaking the contract when he accepted the cheque from the defendent for the difference between his original payment and the price of the goods actually delivered.

As compensation for loss suffered through the breach of contract, Mr. Justice Surveyer awarded Gervais $119.85

B. Greening Wire Co. Issue Bonds

The B. Greening Wire Co. Ltd., have been incorporated under the laws of the Dominion of Canada to acquire the properties and business of the B. Greening Wire Co. Ltd., of Hamilton, Ont., one of the largest manufacturers in Canada of all classes of commercial wire, cables, wire cloth, screens, chains, etc. In connection with this incorporation, they are issuing first mortgage, 6½ per cent. 20-year sinking fund bonds, to a total value of $800,000. Aemilius Jarvis Company, Toronto, are underwriting the bonds and have issued a statement, covering the firm's activities, which is very favorable. For the past 10 years the average annual net earnings, after paying all operating expenses, full and proper maintenance charges, but before depreciation and federal taxes, have been not less than $222,000. For the last 7 years the average annual earnings have been $258,410.

The Concrete Institute Will Meet in February

The 20th annual convention of the American Concrete Institute will be held in Chicago on February 25, 26, 27 and 28, 1924.

It is planned that it shall surpass all previous Institute meetings in several distinct respects, among them:

(1) The practical applicability of its subject matter.

(2) The timely nature of the work of committees.

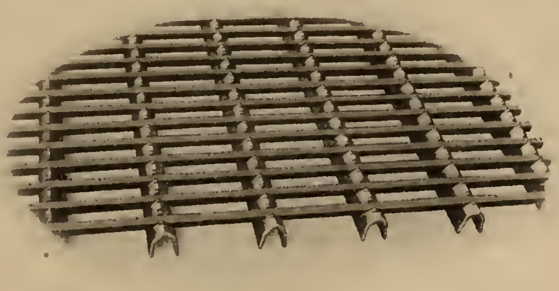
(3) The extent of the field of work covered. This last will be increased by a decision of the Board of Direction to adopt a sectional meeting plan insofar as it is needed to get the closest attention to and freest discussion of special subjects—as for instance, for products manufacturers, building superintendents, reinforced concrete designers. Two meetings in progress at one time will make it possible to devote much more time to each part of the field, leave more vacant periods for inspection trips, and still preserve the unity of the organization for all matters of general interest such as the consideration of factors of good concrete and everything requiring action of the Institute as a whole.

Jenkins Bros., Limited, Win Championship in Industrial Baseball League

Coming back strong after a twelve years absence from the baseball field, Jenkins Bros., Limited, manufacturers of valves, have stepped right into front place in Montreal amateur baseball. At the end of the season their team was tied for first position with the team of the Grand Trunk car shops. The play-off on the grounds of the Imperial Tobacco Co., proved the superiority of the Jenkins men, the final score being 11-7 in their favor. Determined to prove their prowess in still another branch of sport, the Company's employees have now organized a Bowling Team in the Montreal Manufacturers' Bowling League.

M. & M. Safety Grating

For some months past McGregor & McIntyre Ltd., Toronto, Ont., have been manufacturing a grating for covering manholes, trenches and sidewalk areas and for branches in mills, factories and power plants, that has several excellent features. The grating, which is known as the "M & M Safety Grating," is made of ⅜-in. square steel cross bars, spaced ¾-in. apart, supported and braced at 4 in. intervals by inverted V-shape longitudinal members, the ridges of which stand up very slightly above the general level of the grating surface, thereby affording a safe footing and perfect security against side-slipping. M & M gratings can readily be arranged to lift out or to open on hinge pivots to meet any special requirements. They are very light in weight; are made without bolts, rods, thimbles or rivets; and are cross locked under a machine pressure of 80 tons and cannot become loose or rattle.



The M. & M. safety grating

Logical to Study Road Needs Now

Record-breaking crops have called for an almost unprecedented service to be given by highways during recent weeks. It is estimated that the farmers have received vastly more for the products of their fields this year than came to them during 1922.

These facts suggest that it is a good time to impress upon the "powers that be" in agricultural sections the taking stock of necessary road improvements and new highway construction.

The heavy traffic which roads serving farmers have been called upon to handle during the last few months should be taken into consideration, especially in judging gravel roads carrying from two to five times more travel that can be handled on them with economy and satisfaction.

This general line of thought is amplified in a bulletin issued this week by Charles M. Babcock, state highway commissioner of Minnesota.

Farmers doing fall hauling are urged to think over the road situation, noting savings and benefits returned by improvements and those which would result from further betterments. Many farmers studying farm costs will be able to determine in dollars and cents the extra profit they are taking by hauling bigger loads in shorter time on improved roads or that would be possible if needed improvements were made. They may satisfy themselves, the bulletin adds, that better roads offer the biggest returns on investment of public funds.

Automobile users, also, can well afford to think about better roads—estimating likewise the savings already coming with less car upkeep, tires and gasoline on improved sections and those to come when improvements are extended. The average car owner, it is suggested, will conclude that his motor vehicle tax is money spent to his great advantage.—A. G. C. News-Letter.

The Evolution of Lime Mortar

Commercial quicklime may be defined as the product resulting from the calcination, or burning, of a limestone consisting of the carbonates of calcium and magnesium, which slakes upon the addition of water.

The limestone is quarried and broken into sizes suitable for uniform burning. It is fed into kilns and heated, or as it is commonly called, "burned." The temperature required for this process varies, according to the chemical and physical characteristics of the stone, and ranges from 1,400 to 2,200 deg. Fahr. What is known as high calcium limestone is calcium carbonate, having a chemical formula $CaCO_3$, and may be considered as being composed of calcium oxide (CaO) and carbon dioxide (CO_2).

During the burning, the chemical structure of the stone is changed. The carbon dioxide, which is the same gas as is used in making soda water, is driven off by the intense heat, leaving the calcium oxide or burned stone, which is commercially known as quicklime.

Preparation of the Paste

This quicklime will readily combine with water, or slake. Slaking is a chemical process and is the combination of the calcium oxide with the water to form what is known as calcium hydroxide, or hydrated lime. In the field, however, more water is added than is necessary for the chemical reaction, and a paste is formed. The consistency of this paste may be varied at will by varying the amount of water added. Some manufacturers hydrate their product at the plant, adding only enough water to the lime to satisfy the chemical needs, and their hydrated lime is a fine dry powder. The further addition of water to this powder does not change the chemical composition, but merely the physical form making it a paste suitable for use. In mortar, plaster, or stucco, this paste made from either lump or hydrated lime, is the material which binds the sand grains together into a workable mixture.

After this mixture of sand and lime paste is applied, it hardens. This occurs, first, through drying, or the evaporation of the excess water used in making the paste, and then through the absorption of carbon dioxide from the air. This is a gradual process and changes the calcium hydroxide back into calcium carbonate, or limestone. Thus there is a cycle of changes involved, starting with raw limestone and ending with a stone consisting of sand grains bound together by limestone.

An Idea of Materials Required for a Mile of Concrete Road

Figures prepared by the U. S. Department of Agriculture and published in Bulletin 1077, give an interesting idea of what enters into the construction of one mile of concrete road, taking into account not only the amount of cement and aggregate, but also the miscellaneous materials that directly or indirectly are factors of the production of the finished pavement.

According to the estimate given in the government bulletin, a mile of concrete pavement, seven inches thick at the edges and eight inches thick at the center, will require 3,913 barrels of portland cement, 2,249 cubic yards of concrete, including 1,102 cubic yards of sand, or fine aggregate, and 1,664 cubic yards of coarse aggregate or stone.

In making 3,913 barrels of portland cement over 390 tons of coal are burned at the cement mill. Approximately nineteen tons of gypsum are required to regulate the setting time of the material. To get the cement shipped to the construction job, over 15,600 cloth cement sacks are needed—and approximately 15 bales of cotton must be woven into cloth to supply this item. Incidentally, over 30,000,000 cloth cement sacks are lost or destroyed each year, and the textile mills are called on to furnish material for the replacement. Back in the cement quarries, approximately 450 pounds of dynamite were shot off in blasting loose the raw materials required for the mile of highway.

The government bulletin estimate that 30 gallons of water are needed to mix and cure a square yard of concrete pavement. Over 300,000 gallons of water must be furnished for the mile of road, and approximately 4,500 tons of concrete go into the construction.

A good idea of what the highway construction business means to the railroads can be obtained from the requirements of the mile of concrete road. About 42 cars of fine aggregate, or sand, are needed on this job. Sixty-five cars of coarse aggregate are required, and it takes 20 cars to haul the cement—or 127 cars for the basic materials. Where reinforcing is specified, further transportation is called for, while the water supply is governed by local conditions.

For the Building Supply Dealer

Ideas That Enable the Dealer to Sell More Flooring

How Dealers Can Capitalize on Displays and Advertising—Methods That Have Been Found Effective by Experience

By the Maple Flooring Mfrs. Assn.

A summary of the retail lumber merchant's problem, given by a writer for "Advertising & Selling," points out the condition as he sees it—it shows the lines along which we must work if we are to bring increased sales and better business conditions for the lumber merchant. He says:

"The building merchant is a seller of slow moving goods, most of them in great bulk. His stock is turned over perhaps twice a year, perhaps once. His original investment is heavy. His credit sales run into large sums. His handling costs are high. He has relatively few opportunities to increase the volume of his business by special sales or other like methods."

"His stock is turned over perhaps twice a year, perhaps once." And yet, business investigators have proved that it is possible to make as high as four turnovers in the lumber business in cities of under 10,000, and three turnovers or better in larger cities. Advertising and properly directed selling can help you reach this goal, because it can make stock move faster, and put the right pressure behind the slow mover.

"His credit sales run into large sums." And yet, large lumber yards have adopted energetic credit policies, backed them by the right kind of advertising, and finished the year with as low as $60 on their books, more than sixty days old.

"He has relatively few opportunities to increase the volume of business by special sales." But what are these opportunities? How can they be improved? Others have found ways to speed up sales, which will be given in this article.

It might have been added, that the lumber merchant is dependent upon many classes of people and many factors for his full volume of sales. What are these factors? How may they be cultivated and made to bring more sales? You will find in the following paragraphs, some answer, also, to this question.

What Factors Control Sales?

Back of individual selling effort there are certain large influences which can hold you back and undermine all that you do—or they can make every effort on your part doubly effective, if conditions are right.

How are conditions in your case? It is only possible here to touch upon them, and raise the question for you to answer yourself.

How do you stand with the public? Do you have a general reputation for quality, for giving good service, for delivering full value? Unless you have, the effects of your selling or advertising effort will be lessened. The remedy, in part, lies in selling the right kind of material—and the right material for the right purpose. It lies in knowing how to care for the material, up to the time it is delivered, and in making careful and prompt delivery.

How do you stand with contractors? They buy great quantities of material themselves. They can refer other people to you. Prompt service, fair prices, material of standard quality, all help sell to them. Personal acquaintance is also important.

How do you stand with architects? These men are sticklers for quality—they want everything according to specification—they feel a certain pride in their own opinions. Handling graded and guaranteed products is one way of winning them. It is important to let them know that you handle trademarked brands—and to convince them that you deliver the grade and brand which they specify.

Are you in the right location to get the business? Many lumber yards have found that it paid to use more expensive ground, nearer the center of their cities, instead of a location at the edge of town. If you are located at the edge of town, see that the sidewalks leading to your office are in good condition, that the approach to your office is attractive. Large department stores place the selling value of their windows at millions of dollars. Displays will also sell lumber. Have you any place you can make good displays?

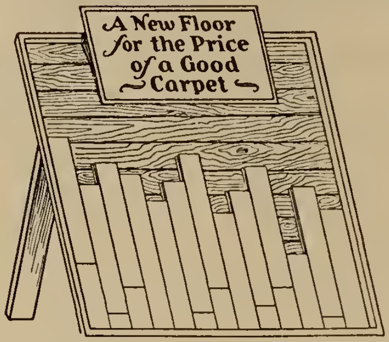
Reaching Out for Sales

One of the easiest ways to reach people who do not often come to your office or your yard, is to put a display in a vacant store window in the business section of town.

The majority of people buy by looking in windows. And while you may think at first that selling lumber is different from selling other things, remember that lumber is used in the home, along with wall paper, rugs, furniture, paints and varnishes, and any number of other things which are bought in the business section.

Window Displays Which Bring You Business

The most interesting window is the one which tells a story. Suppose you wanted to make a display which would sell ⅜" Maple, Beech or Birch as a new floor for old residences. You could make up a section of floor about 3 x 4 feet, by nailing ship lap or some other wide and rough looking boards to 2 x 4's. If this example of "old floor" could be scarred and marred, so much the better. Then, crosswise of this old floor, you could nail ⅜" new flooring, covering about half the old floor completely and tapering off toward one side to show the tongue and groove side and end matching of the new floor. This new floor could be left bare and clean, or it could be finished with a coat of varnish to bring out its beauty. When this floor was set up in a window with some such a sign as the following, it would attract an immense amount of attention:



A New Floor For the Price of a Good Carpet

You can lay ⅜" Maple, Beech or Birch Flooring right over your old floor and have a beautiful, clean, durable, modern floor at surprisingly low cost. For a room 12 x 14 feet this flooring would cost $00.00.

If this floor is varnished, it is highly probable that you could get a varnish dealer to co-operate with you, and let you put the display in his window, so that it would help his business.

Other displays could be made from time to time out of pieces of flooring which had given unusual service in well-known buildings. When you hear of such a building that is to be wrecked, be sure to have someone get samples of flooring as well as other materials you have furnished. Such flooring could be featured with such a sign as this:

As Good as New
After 20 Years' Service

This piece of flooring was removed from the entrance of the Central Grammar School. Floors for the building were supplied 20 years ago by
YOUR NAME HERE
Call on us if you want long wearing floors.

Sometimes interesting photographs can also be secured. You could get double use out of a display of "color harmony" flooring panels if you used them in connection with photographs of the interiors of any well-known hotel, club or residence in which flooring sold by you had been used.

The value of such displays is not limited to the short time you use them in windows. They can be kept in your office as objects of continual interest for new customers.

Getting Newspaper Co-operation

If you are doing business in a comparatively small city, it is frequently possible to get extra value out of an exceptionally attractive window display, for that is genuine news to the paper's readers. Particularly if you use newspaper advertising—and you should—the paper will be willing to mention such displays in an article.

A Display Which Sold Short Lengths

At the Lumber Dealers' Convention in Minneapolis, a local lumber company made a special exhibit of short lengths, as shown by the illustration of their display. The appearance of the flooring as actually laid was a pleasant surprise, even to dealers who were familiar with the floorings. It is an attractive floor for a moderate price.

Why not make a similar display in one corner of your office—or a single panel, showing what a serviceable and attractive flooring these short lengths make, because of their side and end matching? One dealer makes a specialty of selling short lengths, and buys a majority of the output from one of the manufacturers. This shows what a profitable business can be built upon a side line by pushing it with energy.

A Permanent Window Display

One good way to get flooring before the public is to sell it to a retail merchant for the flooring of his window. While this window may not advertise you directly, you can refer to it in talking to customers and thus show them how beautifully the flooring will finish.

Sales That Bring More Sales—Selling the Leaders

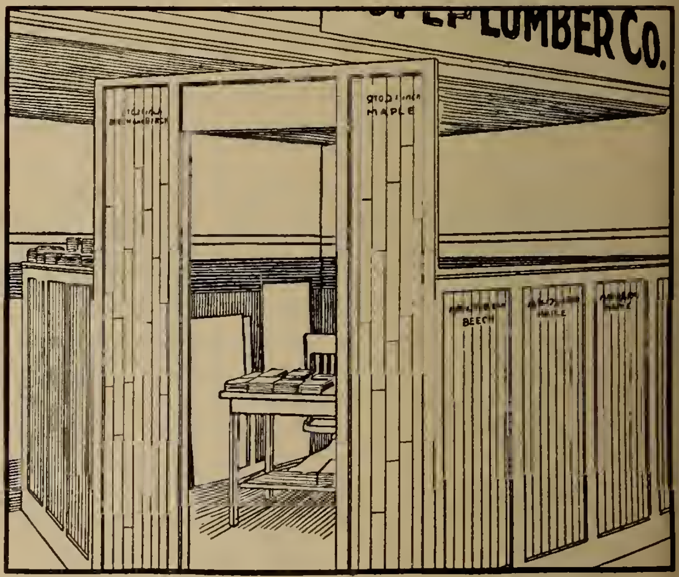
If you are limited in selling time, or if your sales force is limited, it is a question how to make the best use of your personal selling time.

The best rule is to "work from the top" in selling. That is, to go to the leaders and sell them. The rest of the people will follow almost automatically. If Mrs. Smythe-Brown is a social leader, be sure that her home has hardwood floors. Then her enthusiasm and her example will make other women follow her lead.

The same thing holds true in selling flooring for business buildings, factories, etc. Try to get all the business you can, but be sure that you land the leader.

Winning Sales by Advertising

What has gone before has been a discussion of the use of personal salesmanship and solicitation. Before going further with this subject, it is important to know the most economical method of doing this missionary work"—of selling people by groups instead of individuals—of getting them into the idea of coming to you—in other words—advertising.



An effective display

The question of advertising and the effects of advertising and methods of selling were covered in a list of questions sent out to 10,000 retail lumber dealers. From these answers some interesting facts regarding the methods of lumber merchants were secured.

In answer to the questions of where the names of prospective customers were secured, the following sources were given, many replies giving more than one source of information:*

21% got information from contractors.
19% got information from architects.
19% got information from building permits.
11% got information from their salesmen.
11% got information from letters.
11% got information from directories.
10% got information from replies to advertising.
10% got information from carpenters and mechanics.
10% got information from real estate dealers.
3% got information from building & loan associations.
1% got information from banks.

*All percentage figures given are based upon answers received as to each separate source of information.

Among the other sources given were everything from the lists of marriage licenses issued to news gathered by the merchant's wife visiting the ladies' aid. Tax lists, bonuses to employes, lists of new arrivals, reports of master builders' associations, all were used.

As to kinds of advertising used, the following figures are of interest.

3/4 use newspaper advertising.
3/5 use selling letters.
1/2 use sign boards.
1/3 use signs on buildings under construction.

As to the effectiveness of these various forms of advertising, according to the experience of those who answered:

32% found newspapers most effective.
28% found letters most effective.
10% found signs on buildings under construction the most effective.
20% voted for cards, folders and circulars.
10% miscellaneous.

These figures are interesting in themselves, but they are principally valuable in indicating where the retail lumber merchant can make a stronger attack, and where he can be helped the most by experienced advertising assistance.

For instance, only 1% secured information from banks, and yet if you could get your bank to work with you, it would be one of the most valuable sources of information as to who was getting money to build.

In the same way, building and loan associations are for the purpose of helping people build their own homes. You could very well afford to stand well with these associations, and even to co-operate with them in advertising, if you should get your share of the business they control. For, remember, the building and loan association practically finances the building of the home. If you worked together with an association, you could be absolutely sure of prompt pay for the material which you furnish. If you are to do a credit business on homes, you could better afford to organize your own "building and loan" department and thus be sure of the proper security and the proper rate of interest on any outstanding debts.

In the case of advertising, the figures as to the effectiveness of what the lumber merchant has been able to do in the past cannot be taken as final, since they cannot measure how good the various kinds of advertising really were to start with. It does not show that better returns could not be secured, if a better idea were back of the advertising. And in many cases, the results of general "publicity" advertising cannot be checked.

Here is the experience of one Nebraska retailer, operating twenty-three yards. He says:

> "We try to get out a letter a month from our yard manager, together with any other advertising in the form of envelope stuffers.
>
> We have experimented with items we have never handled before in the way of flooding our mailing list with circulars on that particular line, and have immediately noticed the effect in the way of receipt of orders.
>
> "...... if you have a half dozen or a dozen pamphlets so they can be sent out a month apart for six months or a year ...... this is much more effective than sending out a more elaborate booklet or larger folder at less frequent intervals."

This man speaks from experience—he tells the results of scientific experiments—and he has found that mailing brings results without a shadow of a doubt—and that continued, persistent effort pays the best.

(To be Continued)

New Books

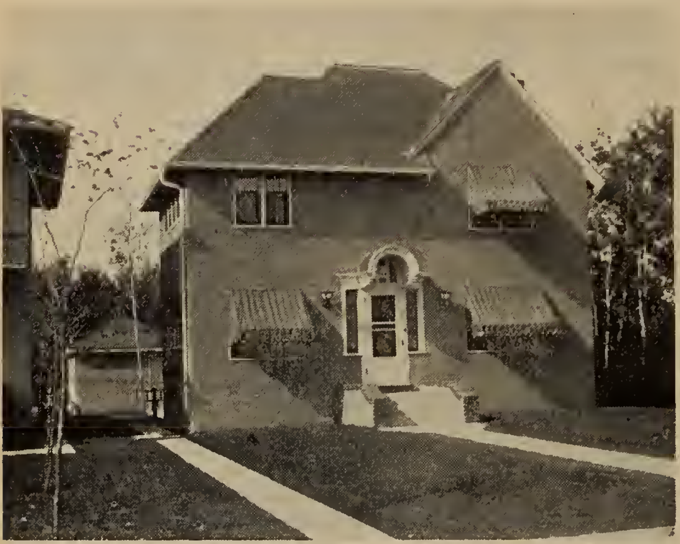
A Book on Estimating for Builders

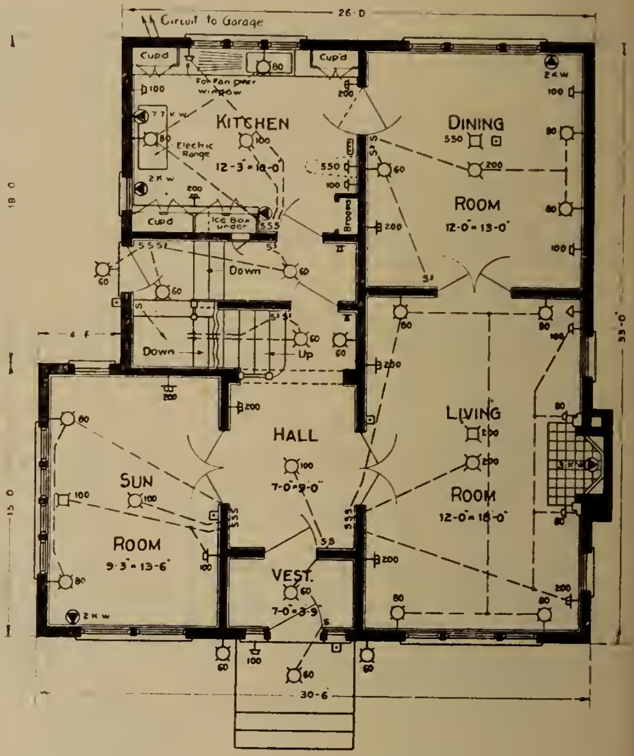
"Estimating Building Costs," by Chas. F. Dingman, M. Am. Soc. C. E., M. Am. Soc. M. E. This book, issued in convenient size, will undoubtedly be a most useful addition to the working library of every builder and contractor, especially those who are seeking for authoritative and easily applied information on estimating methods. No one phase of the contracting business is so fraught with uncertainty and so little understood as estimating and it is to help to overcome these difficulties that this book is published. Mr. Dingman puts into it the experience gained as a result of about 15 years' work in presenting to ambitious young men in the building profession the rudiments of the knowledge required to become competent estimators. While the book alone cannot make a good estimator, nor does it claim to do so, a study of the principles expounded will develop the necessary habits of thought, which, combined with practical experience and keen observance, will enable the student to become qualified as an estimator. It is not a cost data book in the ordinary sense of that term, although it does include valuable tables, arranged for rapid reference. One excellent feature is the tabulating of the information on the basis of production per man hour, rather than on that of the money cost per unit. The text is divided according to the following chapter headings: Excavating, grading, bracing; brickwork; stone work, cement block work, architectural terra-cotta; fireproofing and fireproof construction; plain and reinforced concrete; timber framing; boarding, planking shingling; finished carpenter work; structural steel and iron work, steel sash; lathing, plastering and stucco work; painting and paper hanging; roofing and sheet metal, damp-proofing and waterproofing; short-cut methods of estimating; summary. Published by McGraw-Hill Book Co. Inc., New York. Price $2.50.

The contractor or plasterer who makes a specialty of quick repair jobs would do well to slake and age as much lime as he can store without danger of freezing at this time. The longer the paste is stored the smoother it becomes, and it is the ideal material for making repairs. It can be handled easily and used under practically any conditions.

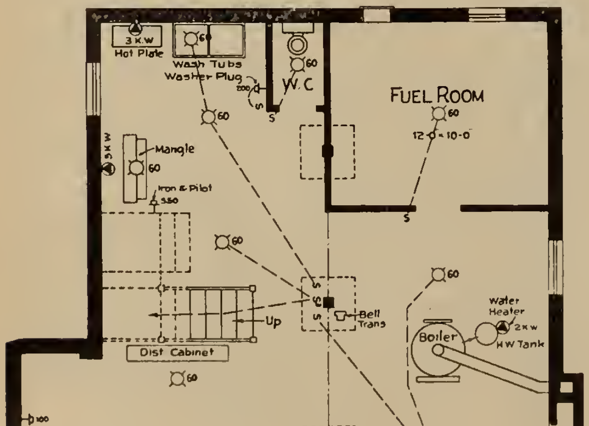
The Contract Record's

Weekly House Suggestion No. 87



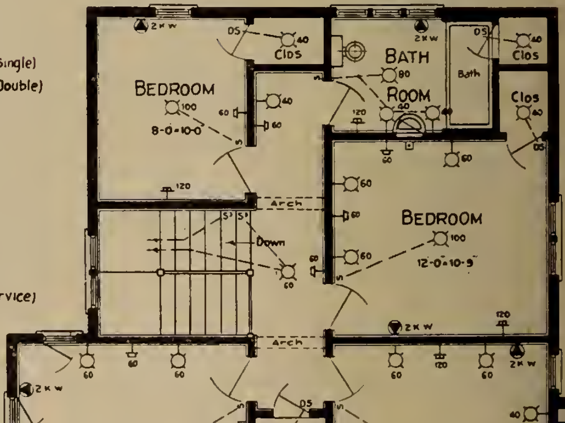


With the object of demonstrating the convenience and comfort of a home that is completely equipped electrically, the Manitoba Electrical Association recently opened the first Winnipeg "electric home". An illustration of it appears above, along with the floor plans which indicate the completeness of the electrical equipment.



SYMBOLS.

○	Ceiling Outlet
⊢	Convenience Outlet (Single)
⊢	Convenience Outlet (Double)
⊢○	Wall Bracket.
●	Heating Outlet
S	Single Pole Switch
S³	3-Way Switch
DS	Door Switch
◻	Floor Outlet
⊡	Push Button (Bell)
⊨	Telephone (Private)
▶	Telephone (Public Service)
▽	Bell Transformer
⊳	Radio Plug
▭	Annunciator.



Mainly Constructional

East and West—From Coast to Coast

A start was made recently on the Avoca Vale bridge at Toronto. The bridge will be 86 ft. wide, to allow for the laying of car tracks, and will cost approximately $570,000.

The ratepayers of Vancouver will be asked to vote on a by-law to provide $500,000 for the building of schools, at the annual elections on December 12. New schools are urgently needed in the east and west ends and at Kitsilano, state the school trustees.

Thirty acres of land have been purchased by a syndicate of Toronto business men in that district of the city northeast of Rosedale and it is planned to erect 175 homes here, at an estimated cost of $1,750,000. The plan of development will be along the line of England's garden cities. This district will be reached by the new Governor's Bridge, now under construction.

Building permits issued so far this year at Greater Winnipeg, which includes the municipalities of St. Boniface, St. Vital, St. James, East and West Kildonan, Fort Garry and Transcona, represent building valued at $5,544,504. Winnipeg itself is responsible for about two-thirds of this total.

The new Gerrard St. Bridge over the Don River at Toronto is about completed, the only work remaining being the laying of tracks and the finishing up of paving work. Pedestrian traffic was allowed over the bridge a few days ago.

Over $5,000,000 will have been expended by the City of Montreal in public works this year, it is estimated from compilations being made at the City Hall under direction of H. A. Terreault, Director of Public Works. The sum of $4,000,000 was spent last year and $3,500,000 the preceding year.

Following Mr. E. H. Darling's report on a proposed water system for the town of Port Colborne, Ont., the town council decided to draw up a by-law to be submitted to the ratepayers at the annual elections on December 3, authorizing the issuance of debentures to the amount of $78,000, to cover the cost of the system as outlined in Mr. Darling's report.

Speaking before a luncheon meeting of the Ottawa Branch of the Engineering Institute of Canada, at the Chateau Laurier recently, Hon. J. H. King, Minister of Public Works stated he did not think the Government of Canada or the people are in a position to even consider the project of the St. Lawrence waterway and would not be in a position until it has been thoroughly investigated by a board of engineers representing Canadian interests.

Contract for the construction of a 110 ft. water tower, with a capacity of 500,000 Imp. gals., for the Water Works Commission, at Oshawa, Ont., was awarded recently to the Dominion Bridge Co., of Montreal. The new tower will be located in the north part of the town and when completed will afford more adequate fire protection for all parts of the town.

The contract for the construction of the new dam on the Metis River, Matane County, P. Q., was awarded recently by the Quebec Running Streams Commission to the firm of Newton Dakin Construction Company, of Montreal, at a cost of $109,557.55. The contract is subjejct to approval by the provincial cabinet. The tenders received were as follows: MacDonald Engineering Company of Canada, Toronto, $259,249.80; A. H. Morin, Trois Pistoles, $198,279.50; Frank Walters and Company, $124,654.95; Gorman and Peckman, Chicoutimi, $204,597; Atlas Construction Company, Ltd., Montreal, $139,594.12; Dibona and Orlando, Bridgetown, N. S., $169,003; Bourassa Clifford Corporation, Limited, $107,707.80; Newton Dakin Construction Company, Montreal, $109,557.55; Lower St. Lawrence Power, $117,622.10; Northern Development Company, Ltd., $163,262.65. The lowest tender was not accepted because there were certain conditions, which were claimed to be of such nature as to raise the cost.

Personal

Mr. R. C. Desrochers, secretary of the Dominion Public Works Department, Ottawa, has been made Assistant Deputy Minister of the Department, according to a recent announcement of the Civil Service Commission. Mr. Desrochers has occupied the position of secretary of the department for the past thirteen years.

Mr. R. D. Corriveau has been appointed to the position of assistant chief engineer of the Dominion Public Works Department, Ottawa. He succeeds Mr. K. M. Cameron, who was recently made chief engineer. Mr. Corriveau is a McGill University man, having received the degree of Bachelor of Science from that institution in 1900. He has been with the Public Works Department since 1898.

Obituary

Mr. George P. Beswick, president of Beswick & Co., contractors' equipment supplies agents, Esplanade and Sherbourne St., Toronto, died recently in that city at the age of 44. He was secretary of the Purchasing Agents' Association and was well known in Toronto sporting circles.

Mr. W. G. Bligh, retired executive engineer of the Indian Public Works Department, but who has resided at 25 Elgin Ave., Toronto, for the past few years, died recently in Calgary aged 77 years. Mr. Bligh designed and constructed some of the largest irrigation works in India and Burma and was author of "The Practical Design of Irrigation Works," a recognized text authority on the subject. Mr. Bligh was born at Great Malvern, England, in 1846.

Trade Incorporations

Emery Steel Co. Ltd., with head office at Montreal, capital $299,000, to carry on the business of manufacturers and dealers in steel and iron.

Rene de Montigny was a recent registration at Montreal, and will manufacture cement blocks.

A recent registration at Montreal was that of Riepert & Foster, to carry on a contracting business. The principals of the company are Otto V. Riepert and Howard A. Foster.

Joseph Delisle & Cie. Enreg., general contractors, were registered recently at Montreal.

Armand Sicotte & Cie., general contractors, was a recent registration at Montreal. Principals, Armand Sicotte and Edmond Belanger.

Cairnie Construction Company was registered recently at Montreal. Principals are Lorne McD. Cairnie and Hugh C. Walkem.

Tetrault Construction, Ltd., with head office at Ste. Germain de Grantham, capital $10,000, to carry on a general contracting business.

The Nelson River Construction Co., Ltd., has been incorporated to carry on a general contracting business at Winnipeg.

Excelsior Concrete Products, Ltd., were recently granted a charter to operate a manufacturing business at Chatham, Ont.

Kensington Building, Ltd., with head office at Toronto, capital $40,000, to carry on a real estate and building business.

CONSTRUCTIONAL ACTIVITY

Period of October 24 to October 30, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Fort Erie, Ont.
Tenders are being received till November 2 by the town council, through the clerk, A. E. Scaton, for construction of approximately 1 mile of trunk sewers and appurtenances in connection with $50,000 sewage system. Plans and specifications etc., with clerk and the engineers, James, Proctor and Redfern, Ltd., Toronto.

Ford, Ont.
The town council contemplates the laying of sewers on Barnard St.

Kingston, Ont.
The city council is having sewers laid on Montreal St., at a cost of $10,902.15. Work day labor by owners. Engineer in charge is Howard Dick. No material required.

Ste. Tite, Que.
The town council contemplate building a road at Grand Rang to cost $6,000.

Toronto, Ont.
Tenders are being received till November 6 by C. A. Maguire, Chairman, Board of Control, for laying and jointing water pipes on St. Edmunds Drive.

Tenders are being received till November 6 by C. A. Maguire, Chairman, Board of Control, for asphalt pavement on Strickland Place.

Tenders are being received till November 6 by C. A. Maguire, Chairman, Board of Control, for sewers on Duplex, Hudson and Errington Aves., and Rosedale Heights Drive.

CONTRACTS AWARDED

Englehart, Ont.
The town council has awarded S. Veraldi, North Bay, the contract for extension to sewers and watermains, at $12,500. G. F. Summers, Haileybury, is the engineer.

North York Twp., Ont.
The township council has awarded the contract for laying and placing sidewalks and pipe, etc., to Ruscica Bros., 256 Ontario St, Toronto.

Richmond Hill, Ont.
The town council has awarded Warren Bituminous Paving Co., Toronto, the contract for pavement on Yonge St., at $70,000.

Sydney, N. S.
City council and Nova Scotia Steel & Coal Co., contemplate laying approximately 2 miles of water main to cost $100,000.

Sherbrooke, Que.
H. C. King, city hall, Sherbrooke. Que., is receiving prices on cement asphalt and granite blocks in connection with paving of streets to cost $300,000. Work by day labor.

St. Lambert, Que.
The city council has awarded the following contracts for reinforced concrete pipe; clay pipe—Standard Clay Products Co., St. Johns, Que., at $6,000; laying of pipes—G. H. Parker, 40 Drummond St., Montreal, at $5,000.

Sandwich, Ont.
Webster Construction Co., Ltd., London, Ont., have been awarded the contract for sewers on Partington Ave., at $24,152.

Stamford Twp., Ont.
The township council has awarded the following contracts in connection with $28,000 sewer system; sewer pipe—John E. Russell & Co., Toronto; manholes and catchbasins— L & P Mfg. Co., Niagara Falls, Ont., at $1,580; laying pipe—Sacco & Lorenzo, Niagara Falls. Ont.

Toronto, Ont.
The city council has awarded W. E. Taylor, 22 Falcon St., the contract for sewers at $10,766, on Henning Ave., Tilson Ave., and both sections of Millwood Rd.

The following contracts have been awarded by the city council in connection with Chatham. drainage system; Phin Ave. $1,453—W. E. Taylor, 22 Falcon St.; Chatham Ave., $11,988. Aakvale $1,617, Leslie St. $1,480—National Contracting Co., 9 Garnock Ave

Railroads, Bridges and Wharves

Prairie Siding, Ont.
Tenders are being received by engineer, W. G. McGeorge, C. E., 153 Queen St., Chatham, Ont., till November 22, for super-structure of bridge over Thames River. Plans and specifications with engineer.

CONTRACTS AWARDED

Burlington Beach, Ont.
Hamilton Harbor Commission have awarded the general contract for new piers south of the bridge, to Port Arthur Construction Co., Ltd., Toronto, at $53,000.

St. Zotique, Que.
N. A. McDonald, Dalhousie Station, Que., has the general contract for bridge "No. 9," at $8,500.

Public Buildings, Churches and Schools

Birch Cliff, Ont.
Tenders are being received by the architect, J. Francis Brown, 2 Bloor E., Toronto, Ont., for the basement of church to be built for Birch Cliff Baptist Congregation. Plans and specifications with architect.

Gore Bay, Ont.
Tenders are being received by the Dept. of Public Works, through the secretary, H. F. McNaughton, Parliament Buildings, Toronto, till November 10 for addition to court house. Plans and specifications with Department, and office of Sheriff, Gore Bay, Ont.

Montreal, Que.
Tenders are wanted on plastering in connection with school being built for R. C. School Commission, 2367 Adam. Architects, Brenier & Despattie, 294 St. Catherine E. General contractor, J. C. Frennette, 324 Breboeuf St.

St. Lukes Church, Ros., contemplate building a $40,000 church on Holt Ave., Ros.

Outremont, Que.
Parish Ste. Madeleine D'Outremont, contemplate building a $200,000 church here. Work will go ahead early in spring of 1924.

Ottawa, Ont.
Tenders are being received by the general contractor, J. E. Poirer, 440 Clarence St., on electric, heating and plumbing, in connection with $18,202 addition to chemical laboratory. No closing date set.

Point grey, B. C.
Sharp & Thompson, 708 London Bldg., Vancouver, are preparing plans for $250,000 central heating plant on University Campus, and tenders will shortly be called.

The Dept. of Public Works is having plans prepared for the erection of $20,000 Home for Incurables, on Marine Drive, Eburne.

Rimouski, Que.
The R. C. School Board is having plans prepared for $35,000 school. Tenders will be called in December.

Saskatoon, Sask.
Tenders will be received till November 15 by the Minister of Public Works. J. M. Smith, for the construction of $400,000 tuberculosis sanitarium. Plans and specifications with architect, M. W. Sharon, Parliament Bldgs., Regina, Sask.

Victoriaville, Que.
Rev. Bros. of the Sacred Heart are having plans prepared for $75,000 alterations to college.

Vancouver, B. C.
Tenders are being received by the architects, Honeyman & Curtis, 506 Credit Foncier Bldg., Vancouver, B. C., in Connection with $20,000 church to be erected corner 18th Ave. and Glen Drive for St. Pauls Presbyterian Church.

Windsor, Ont.
Tenders are being received by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, Ont, till November 8 for alterations to public building.

Plans and specifications at offices of chief architect, Dept. of Public Works, Ottawa, resident architect, Dept. of Public Works, General Post Office, Toronto, and the caretaker of the public building, Windsor.

CONTRACTS AWARDED

Asbestos, Que.
The foundations are going in for $250,000 church for R. C. Parish. Cut stone is being supplied by M. J. Bussieres, Asbestos, Que. No other sub-trades let. Architect, L. N. Audit, Sherbrooke, Que. General contractors, Pourrier & Boulet, Black Lake, Que.

Belleview, Ont.
J. B. Daust, Westboro, Ont., has the general contract for church to be built for R. C. Corporation. Architects, Brodeaur & Pilon, 2 Chateauguay St., Hull, Que.

Brampton, Ont.
M. C. Sackrider, Brampton, has the general contract for $45,000 sunday school for Grace Methodist Church. Tenders are being received by general contractors on all trades.

Cornwall, Ont.
General contract for building of school in East End for R. C. School Board, has been awarded to Belanger & Patenaude. No materials purchased.

Haileybury, Ont.
The following trades have been let on separate school being built here; plumbing and heating—A. Brazeau, Timmins; electric—Hill, Clarke & Francis, Ltd., New Liskeard. General contractor, Jos. Sherwood, Haileybury.

A. Brazeau, Timmins, has the contract for plumbing and heating of public school being built here. Electric work is being done by general contractors, Hill, Clarke Co., New Liskeard.

The walls are now going up for $150,000 court house. W. J. Hynes, Ltd., have the contract for plastering, and Toronto Electric Co., the contract for electrical work. Dickie Construction Co., Ltd., Toronto, have the general contract.

Kingston, Ont.
H. W. Watts, 98 Frontenac St., has been awarded the general contract for $103,000 addition to dormitory for Royal Military College.

Louiseville, Que.
Work has started on repairs to post office costing $6,000. General contractor, Thos. Vanasse; painting and glazing —A. Bastien. Both of Louiseville, Que.

Lytton, B. C.
W. M. Orr, Chilliwack, B. C., has the general contract for $8,100 stock barn for Indian Industrial school near Lytton, B. C. Masonry, electric, plumbing and painting not yet let.

Montreal, P. Q.
H. Chagnon & Cie., 27 Burnett have the contract for millwork, and J. A. St. Amour, 2171 St. Denis, the contract for electrical work in connection with $90,000 hospital at 121 St. Hubert St, for Souers de la Misericorde. General contractors, Ulric Boileau, Ltd., 568 Garnier St. Architect, J. E. C. Daoust, 180 St. James St. Tenders wanted on fire escapes, elevators, marble, tile, ornamental iron, refrigerators, skylights, ventilators, roofing, plumbing, heating, plastering and painting.

The following sub-trades have been let on $42,000 presbytery being built for parish Ste Marguerite—Marie-Alacoque; brickwork—G. D'Amour, 2747 St. Andre; structural steel—Dominion Bridge Co., Ltd., Lachine, Que.; Cut stone—Morrisson Quarry Co., 128 Bleury St. Architect, A. E. Doucet, 195 St. Catherine E., associate architect, Ernest Cormier, Drummond Bldg. General contractors, Ulric Boileau Ltee, 568 Garnier St. Marble, millwork, roofing, electric, plastering, painting and glazing to be let.

Niagara Falls, Ont.
Harry Betts, Dunmer St., has the contract for carpentry work, and J. A. Atkins, Queen St., the contract for painting, in connection with $40,000 Sunday school being built for Lundys Lane Methodist Church. Architect, C. M. Borter, 102 Main St.

Oakville, Ont.
Thos. Shields, Colborne St., has the general contract for $17,800 masonic temple, and is receiving prices on all sub-trades. No materials purchased.

Sherbrooke, Que.
L. Charest, King St., has the contract for excavation work for $300,000 Normal school to be built on Beckett Rd. Architect, L. N. Audet and J. O. Marchand, Wellington St.

Sydney Mines, N. S.
George Acker, Sydney Mines, has the contract for plastering, and Harry Clarke, North Sydney, contract for painting, in connection with $80,000 school on Main St. Architect, Angus J. McCormack, Sydney. General contractors, McNeil Bros., Sydney Mines.

Thorold, Ont.
Foundations are in for $82,000 school on Queen St. Carpentry—W. W. Park, 49 Queen St. Roofing, sheet metal, electric, plumbing, heating, ventilating, plastering and painting to be let by general contractor, Newman Bros., 75 St. Paul St., St. Catharines, Ont.

Three Rivers, Que.
Valere Garceau, 238 St. Julie, has the contract for plastering and plumbing of kiln and heating system costing $75,000, for Hospital St. Joseph. General contractor, Beaudry & Trepanier, 34 Badeaux St. Architects, Asselin & Denoncourt, 42 Alexandre St.

Toronto, Ont.
The walls are going up for $100,000 addition to church for Danforth Ave. Methodist Congregation. Roofing—E. Lankin & Son, 56 Lippincott St.; painting—W. H. Hawkins, 94 Nairn Ave. Plastering and electric to be let. G. M. Miller & Co., 93 Yonge St., are the architects.

F. Markham, 156 Alexandria Blvd., has the general contract for $12,000 parsonage on Stibbard Ave. for Eglinton Ave Methodist Church, and buys all material.

Timmins, Ont.
The foundations are going in for $20,000 High school. Plastering—Hewson & Potter, Brantford; sheet metal—A. Brazeau, Timmins. Architects are Pennington & Boyde, Windsor, Ont.; associate architect, J. W. Leighton. General contractors, Schultz Bros. & Co., Ltd., Brantford. Painting to be let.

Waterloo, Ont.
The walls are going up for $40,000 college for Waterloo Lutheran Seminary, Doerr Electric Co., Kitchener, Ont., have the contract for electrical work. Architect, W. H. E. Schmalz, Kitchener.

Westboro, Ont.
J. B. Daust, Westboro, has the general contract for church to be erected for R. C. Corporation. Architects are Brodeur & Pilon, 2 Chateauguay St., Hull, Que.

Business Buildings and Industrial Plants

Cap Rouge, Que.
St. Regis Paper Co., 30 East 42nd St., New York, contemplate erecting a saw mill to cost $1,000,000. Montreal representative of this firm is A. P. MacKinnon, Trust Bldg., Place D'Armes, Montreal.

Fredericton, N. B.
Tenders are being received by the owner, Jas. P. Farrell, 301 York St., for rebuilding of business block. New building, concrete, steel and brick construction.

Glace Bay, N. S.
McKinley & Sons will start shortly rebuilding their factory at a cost of $10,000, Work day labor by owners.

Kingsville, Ont.
John Ross & Co., tobacco manufacturers, contemplate the erection of a warehouse..

Montreal, Que.
J. P. Turner, 274 Beaver Hall Hill, is preparing plans for addition to Molsons Bank, 200 St. James St. Tenders will probably be called this fall by the architect.

Newcastle, N. B.
Canada Creosoting Co., Ltd., Toronto, are having plans prepared for the erection of a creosoting plant, 40 x 150, concrete and steel construction. They will also lay about 6 miles of narrow guage railway. Work expected to start in about two weeks and will be done day labor under supervision of owner's engineers.

Port Hope, Ont.
Bush English China Co., Ltd., contemplate an addition to their factory here.

Preston, Ont.
J. Hunt Stanford & Son, 67 Yonge Arcade, Toronto, are preparing plans for a hotel to be erected here.

Three Rivers, Que.
Work has just started on the installation of an aero plant costing $7,000 for the Laurentide Air Service.

Toronto, Ont.
The walls are going up for $100,000 manufacturing building north east corner Spadina Ave. and Phoebe St, owned by Empire Clothing Mfg. Co. The following sub-trades to be let; roofing, painting, electric, heating and plumbing. L. E. Dowling, 167 Yonge St., is the general contractor, B. Brown, 287 Spadina Ave., is the architect.

Vancouver, B. C.
Dowling Furniture Co., Ltd., are hav-

ing plans prepared for $15,000 furniture factory on 12th Ave. near Slocan St.

Gardiner & Mercer, 827 Birks Bldg., Vancouver, are preparing plans for $11,000 patent medicine factory on Hastings St., for Jotto Manufacturing Co., Ltd., of Vancouver.

Walkerville, Ont.

F. Villeneuve Lumber Co., Ltd., contemplate building a $10,000 planing mill on Ottawa St., 1 storey, frame construction.

CONTRACTS AWARDED

Bellevue, Alta.

E. J. Pozzi, Blairmore, Alta., has the general contract for $17,000 rink to be built for Bellevue Rink Association.

Brockville, Ont.

The following sub-trades have been let on new front and 4th story addition costing $5,000, to building owned by Brockville Recorder and Times; steel—Reid & Brown Structural Steel & Iron Works, Ltd.; roofing—Henry Bedard; plumbing and heating—Geo. Ross & Co.; plastering—Geo. Skelton; painting—E. Windford.

Sub-trades as follows have been let on $25,000 office building corner Court House Ave. and King St.; roofing—Henry Bedard; electric—A. G. Dobbie & Co.; plastering— Geo Barclay; general contractor—G. E. Parslow. All of Brockville. Architect, A. Stuart, Allaster, Ont.

Blind River, Ont.

A. McNab, 515 Wellington St. E., Sault Ste. Marie, has the general contract rebuilding hotel to cost $6,000, for J. R. Chenier.

Cornwall, Ont.

Arthur Robinault, Valleyfield, Que., has the contract for roofing in connection with extension to paper mills of Howard Smith Paper Mills Co. Balance of work being done day labor. General contractor is P. Dore, Valleyfield, Que.

Edmonton, Alta.

J. R. McIntyre, Arlington Apts., Edmonton, has the general contract for $10,000 stone working plant on 101st St., for R. T. Dykes, 1061 115th St., Edmonton. No materials purchased. Cement foundation, brick construction.

Hamilton, Ont.

Pouring concrete fourth floor of $350,000 Lister Building, is now being done. A. B. Ormsby Co., Ltd., Toronto, have the contract for kalamein work. General contractors are Piggott-Healy Construction Co ; architect, B. H. Prack, Bay St., Toronto.

Haileybury. Ont.

The walls are going up for $150,000 branch bank of Bank of Nova Scotia. Plastering—W. J. Hynes, Ltd., Toronto; painting—H. Poppleton, Haileybury. General contractors, Dickie Construction Co., Ltd., Toronto; architects, Sheppard & Calvin, Toronto.

Kirkland Lake, Ont.

Hill, Clarke & Francis, New Liskeard, Ont., have the general contract for branch bank of Imperial Bank of Canada. Architect, W. L. Somerville, 2 Bloor St. West, Toronto.

Ottawa, Ont.

The walls are going up for $14,000 garage on Wellington St., for D. Charlebois, 691 Wellington St. Reinforced steel—Mr. Marshall, O'Connor St. General contractor, J. B. Daust, Westboro Rd. Sheet metal by owner. Balance of trades not let.

G. T. Green, 794 Bank St., has the contract for painting on $300,000 branch bank of Bank of Nova Scotia. Carswell Construction Co., Ltd., Toronto.

Ridgeway, Ont.

The contract for plumbing in connection with $67,000 club house being built, has been let to E. Cardwell, 32 Division St., Welland, Ont., at $9,500, and not to Jno. W. Danforth, as previously reported.

Three Rivers, Que.

Germain & Freres, St. Antoine St., have the contract for roofing, plumbing and heating in connection with $30,000 extension to factory on Bellefeuille St. Beaudry & Trepanier, 34 Badeaux, have the general contract.

Toronto, Ont.

Salisbury Electric Co., 112 King W., have the contract for electrical work, and M. A. Farrelly, 600 Coxwell Ave., the contract for plastering in connection with alterations to store at 185 Yonge St. Architects, N. A. Armstrong Co., Ltd., 7 King East, Toronto. Store fronts are being supplied by Toronto Plate Glass Co.

Excavating is being done for $50,000 addition to warehouse at 2 Bulwer St. owned by L. Yolles, 379 Queen St. W. Brickwork—Milton Pressed Brick Co., excavating—Buonvivierre & Co., 697 Lansdowne Ave. Balance of contracts to be let shortly by the architect, Kirk Hyslop, 10 Sparkhall Ave.

Waterloo, Ont.

Harvey Gleiser, King St., has the contract for plumbing and heating in connection with $15,000 addition to factory owned by Bauer Ltd. Ellert Bros., Park Ave., are the general contractors.

Walkerville, Ont.

Contract for plumbing and heating in connection with $7,000 factory for T. H. Taylor & Co., Chatham, Ont., has been let to N. Fielding, 40 Assumption St. Electric, plastering and painting to be let. D. McBrayne, Assumption and Victoria Rd., Windsor, has the general contract.

Residences

Cannington, Ont.

The walls are going up for $18,000 residence for N. D. MacKinnon, Cannington. J. Hunt Stanford & Son, 67 Yonge St. Arcade, Toronto, are the architects. Carpentry and masonry, day labor. Electric, heating, plumbing, plastering and painting trades to be let.

Cooksville, Ont.

Excavating work is being done for 3 residences, $5,000 each, on Centre Rd. N. A. H. Forester, 279 Indian Rd., Toronto, is the owner and builder. Masonry by day labor. No material purchased.

Hamilton, Ont.

Work has just started on $15,000 stores and apartments on Main East, between Tuxedo and Kenilworth. H. J. McQuillan, 668 Main East, is the owner and general contractor, and will let trades.

Work is to start shortly on $10,000 residence on Flatt Ave. Wm. Inrig, 160 Flatt Ave., is the owner and general contractor. No materials purchased. No sub-trades let.

Kitchener, Ont.

Henry Dotzenroth, Simeon St., is the owner and general contractor of $7,500 residence being built on Homewood Ave. Architect, L. Holle, Waterloo, Ont. Electric, heating, plumbing and painting to be let.

Montreal, Que.

S. A. Madoce, 3276a Henri Julien, is the owner of three residences, $10,500, being built on De Gaspe, between Villeray and Faillon. Millwork, roofing, electric, plumbing, heating, plastering, painting and glazing trades to be let.

J. B. Rochon, 267 Decelles, is the owner and builder of 4 residences, $27,000, on Cote des Neiges, between Swail and Pictou. Brickwork, millwork, roofing, electric, plumbing, plastering, and painting and glazing to be let.

Foundations are in for 2 residences, $15,000, on Park Row, between Sherbrooke and C.P.R. J. F. Parisien, 17 St. John St., is the owner and builder. Sub-trades to be let.

J. O. Nantel, 593 Old Orchard, is the owner and builder of 2 residences, $15,000, on Coolbrooke, between Snowden and Cote St. Luc. Brickwork, millwork, roofing, electric, plumbing, heating and tilin gtrades to be let.

A. Arcand, 1006 Sherbrooke E., is the owner and builder of 4 residences, $32,000, on Valois, between Ontario and Rouen. Sub-trades to be let.

The foundations are going in for 6 residences, $28,000 on Van Horne, near Rickland. Owners and builders—Guidazio & Besozzi; architects—Perrault & Gadbois, 2100 Park Ave. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Z. Lamoureux, 2376 St. Denis, is the owner and builder of $12,000 residence on St. Denis, between Belanger and St. Zotique. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

F. Lefebvre, 854 Mt. Royal E., is the owner and builder of $10,000 residence on Papineau, between Mt. Royal and Gilford. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $15,000, on Marcil, between Sherbrooke and C. P. R. J. H. Gagne, 345 Girouard, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

The foundations are in for 2 residences, $12,000, on 10th Ave., between Masson and Dandurand. W. Desjardins, Ste. Anne des Plaines, is the owner and builder. Brickwork, millwork, roofing, electric, plastering, painting and glazing to be let.

Foundations are going in for 4 residences, $28,000, on Belgrave, between Sherbrooke and C.P.R. Z. Trudeau, 311 Marlowe Ave., is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Port Credit, Ont.

J. W. Fletcher, Streetsville, Ont., is the owner and general contractor of $10,000 store and residence on Toronto St., and buys material. Electric, plumbing, heating, plastering and painting trades to be let. Architect, W. J. Burns, Mississauga Rd.

Riverside, Ont.

H. C. Milligan, 1105 Detroit Saving Bank Bldg., Detroit, Mich., contemplates building $250,000 residence on Riverside Drive. H. Keyes, Dowler Bldg., Windsor, Ont., is the architect.

Toronto, Ont.

The foundations are going in for 1 pair residences, $8,000, on west side Brookside Dr., near Burgess Ave. Alf. Spicer, 128 Barrington Ave., is the owner and builder. Electric, heating, painting, plastering and plumbing to be let.

The walls are going up for 2 duplex residences, $25,000, east side Keele St., south east corner Valley Crescent. J Ewing, 1625 Bloor West, is the owner and builder. Tenders are being received on plumbing, heating, plastering, painting and electric.

The walls are going up for 1 pair residences, $4,500 each, at 83-5 Marchmont Rd. W. F. McCutcheon, 34 Northcliffe Blvd., is the builder. Tenders are being received on plumbing, heating and electric trades. Plastering and painting by general contract, day labor.

Footings are in for $15,000 residence and garage east side Indian Grove, near Indian Valley Cres. G. S. Sanderson, 291 Indian Rd., is the owner and builder. Tenders are being received on plumbing, heating, plastering, painting and electric trades.

E. J. Moore, 176 St. Clarens Ave., is the owner and builder of 2 detached residences, $10,000, at 680-82 Windermere Ave., and buys material. No material purchased.

J. Grant, 42 Redpath Ave., is having plans prepared for $9,000 residence south side Alexander Blvd., near Heather St. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects.

The foundations are in for $10,000 residence north side Roxboro Ave. E., near Highland Ave. Clarke Bros., 139 Scarboro Rd., are the owners and builders and employ regular staff and buy material as required.

The walls are going up for residences on east side Rushton Rd. at St. Clair. G. H. Brown, 45 Roach Ave., is the owner and builder. Tenders are being received on plastering, electric, plumbing and heating. Painting being done by owner.

Work is to start at once for 24 residences, $4,000 each, on Northview Heights. W. H. Martin, 28 Harcourt Ave., is the owner.

Tenders are being received on painting and plastering in connection with 2 stores and apartments being built at 694-6 College St., owned by J. H. Jolly, 702 College St. Electrical work, day labor by owner.

D. H. Burnham, 260 Lauder Ave., is preparing plans for $15,000 residence on Teddington Park Ave., for H. R. Welton, 24 Adelaide E. No material purchased.

W. W. Petley, 86 Adelaide W., is the owner and builder of $11,000 duplex residence at 60 Winchester St., and will let mechanical trades.

W. Edmonds, 46 Glenholme Ave., is the owner and builder of 3 residences, $7,500 each, west side Robina Ave., near St. Clair W. Tenders are being received on electric, heating, painting, plastering and plumbing.

G. H. Walters, 16 Beechwood Ave., is the owner and builder of 2 bungalows, $4,500 each, south side York Ave., near Syndicate Rd. Electric, heating, painting, plastering and plumbing trades to be let.

Excavating work is being done for 2 bungalows, $4,500 each, south side York Ave., near Syndicate Rd. W. Reed, Lambton Mills P.O., is the owner and builder. Electric, heating, painting, plastering and plumbing to be let.

Excavation work is being done for 1 pair residences, $6,500 each, east side Kenwood Ave., near Louise. T. Henery, 8 Louise Ave., is the owner and builder. Plastering, painting, heating, electric and plumbing to be let.

J. Thistlewaite, 7 Baby Point Rd., is the owner and builder of $10,000 residence and garage south side Baby Point Rd., near Jane St. Plumbing, heating, electric and plastering to be let. Painting by owner.

Verdun, Que.

J. E. A. Benoit, 1200 Wellington St. W., is preparing plans for 12 residences. Tenders will probably be called in about two weeks.

Vancouver, B.C.

Wm. Frederick Gardiner, 701 Vancouver Block, is preparing plans of a $10,000 residence for Dr. T. H. Wilson, 208 Hastings St. Vancouver. Tenders will shortly be called.

CONTRACTS AWARDED

Louisburg, N.S.

Capt. E. M. Dickson, Louisburg, has the general contract for $10,000 reinforced concrete tower and wooden residence.

Montreal, Que.

The following sub-trades have been let on residence at 715 Pine Ave. W., being repaired at cost of $12,000 for J. H. Birks, 715 Pine Ave. W.: electric—J. Anderson, 205 Mansfield; plumbing and heating—Hickey & Aubut, 93 Dominion; painting and glazing—J. A. Guilbault, 662 Park Ladontaine. Plastering to be let. General contractors are Reid Bros., 2a Tower St.

J. Beaulieu, 528 Dorion, has the general contract for 3 residences, $20,000, corner Aylwin and Lafontaine, for W. Reed, L'Assomption, Que. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

A. A. Maurice, 98a Addington, has the general contract for 3 residences, $18,000, on Rosedale, between Sherbrooke and Monkland, for J. G. Bowles, 575 Connaught. Millwork—Mr. Limoges, Terrebonne. Masonry, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let. General contractor buys materials.

J. Marcotte & Cie, 3117 St. Catherine E., have the general contract for 2 residences, $15,000, on St. Urbain, between Bernard and Van Horne, for C. W. Lindsay, 56 Westmount Blvd. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Wm. Rutherford & Sons Co., Ltd., 425 Atwater St., have the contract for millwork on $12,500 residence being built on Dunlop Ave. for J. A. D. Annette, 1727 Hutchison. General contractors, Cook & Leitch, 358 Beaver Hall Hill. Architect, A. Allen, 358 Beaver Hall Hill. Roofing, electric and plastering to be let.

Z. Trudeau, 311 Marlow, has the general contract for $22,000 store and residence on Sherbrooke, near Hingston, for Miss W. J. Elliott, 324 Victoria, Westmount. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling trades to be let.

Mount Royal, Que.

Foundations are going in for 4 residences, $30,000, for Model City Housing Co., Montreal. Bruno St. Pierre, 3448 Henri Julien Ave., Montreal, has the general contract. Masonry, millwork, roofing, electric, plumbing, heating and plastering to be let. Painting being done by general contractor.

New Hamburg, Ont.

C. L. Forler, R.R. No. 1, Baden, has the general contract for $6,000 residence for Hy. Steiner. Masonry, painting and plastering — H. Schultz; electric — Geo. Morley; plumbing and heating—Geo. Steiner. Carpentry and roofing being done by owner.

Oakville, Ont.

The following sub-trades have been let on $12,000 residence being built for Miss L. Travers: plumbing and heating — Wm. Barrett; painting — H. W. French. Both of Oakville. Electric and plastering to be let by general contractor, Thomas Shields, Oakville. Architect, Molesworth, West & Secord, Toronto.

Outremont, Que.

J. Gody, 2934 Drolet, has the general contract for 2 cottages, $8,500 each, on Stuart Ave., near Van Horne, for J. Pratt, 42 Courcelette. Architect, S. Frappier, 2238 Park Ave. Plastering and tiling to be let.

Ottawa, Ont.

Wm. Roy, Armstrong St., has the contract for plumbing and heating of $25,000 apartment house on Wellington and Holland Aves., for Wm. Joynt, Laurentian View, near Ottawa. Balance of trades not let. R. W. James, Creighton Apts., Queen St., has the general contract.

(Continued on page 53)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Sanitary Sewers

Township of York

Sealed Tenders, plainly marked as to contents, will be received by the Township Engineer up to 12 o'clock noon,

November 12th, 1923,

for the construction of approximately 6,000 lineal feet of 12" Vitrified Sewer Pipe, together with the construction of a Reinforced Concrete Septic Tank.

Plans and Specifications may be seen at the office of the undersigned, 40 Jarvis St., Toronto.

The lowest or any tender will not necessarily be accepted.

F. B. GOEDIKE,
Township Engineer.
October 23, 1923. 44-45

Notice

To Sculptors, Architects and Artists

The Government of Canada propose erecting in the Parliament Grounds at Ottawa a monument to the memory of the late Sir Wilfrid Laurier.

Parties are invited to submit designs in the form of sketch models in plaster made at a uniform scale of 1½ inches to the foot.

The design must take the form of a portrait statue.

The competition is open to architects, artists or sculptors throughout the world. The Minister of Public Works, however, reserves the right other things being equal to give preference to architects, artists or sculptors of British birth resident in the British Empire or elsewhere.

The author of the best design who is awarded first place, will be given the commission of the work, and the author of the second best will be awarded a prize of One Thousand Dollars ($1,000.00).

The memorial, including pedestal above the level of the ground, when completed and in position, is not to cost more than Twenty-Five Thousand Dollars, ($25,000.00).

The designs must be addressed to and received by Mr. Eric Brown, Director of the National Art Gallery of Canada, Victoria Museum, Ottawa, Canada, not later than the 2nd day of April, 1924.

Copies of the conditions, etc., and photographs may be obtained on application at the office of the Secretary of the Department of Public Works, Room 784, Hunter Building, Ottawa.

Parties who intend to compete should notify, at once, the undersigned of their intention to do so.

By order,
L. H. COLMAN,
Secretary.
Department of Public Works, Canada,
Ottawa, October 24. 1923. 44 and 46

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Steel Bridge

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Thursday, November 22, 1923,

for the construction of the super-structure of the bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The bridge consists of a 100′ Bascule Double Leaf Span with steel approach spans of 98′ and 158′ and the work includes a Creosote block floor on the Bascule span and concrete floors on the approach spans.

Plans and specifications and form of tender and contract may be seen at the office of the undersigned, Chatham, Ont. A set of plans and specifications may be had by depositing Twenty-five ($25.00) Dollars with the undersigned, which amount will be returned when the plans are returned if a bona fide tender is put in by the party obtaining the plans.

Tenders must be accompanied by marked cheques for at least five percent of the amounts of the tenders.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
43-46 County Engineer.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Addition to Archives Buildng, Ottawa, Ont.," will be received until 12 o'clock noon,

Wednesday, November 7, 1923,

for the construction of an addition to Archives Building, Ottawa.

Plans and Specifications can be seen and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, the Resident Architect, Department of Public Works, General Post Office, Toronto, and the Assistant Mechanical Engineer, Department of Public Works, Dominion Public Works Building, Place Royale, Montreal, P. Q.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, October 16, 1923. 43-44

Equipment Wanted

Second hand Steam Shovel, 3/4 yard Dipper. Traction or Caterpillar mounting. Must be in good condition. Give full description to CITADEL BRICK LTD., QUEBEC, P.Q., CANADA. 44-45

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same.

Box No. 407, Contract Record, Toronto. 44 T.f.

Equipment for Sale

by

The Corporation of the City of Victoria B. C.

The Corporation of the City of Victoria, B.C., has for sale certain equipment used in the construction of the Johnson Street Bridge. The material for sale is as follows:

1	Land Derrick complete (less engine).
2	1 yard Concrete Buckets.
1	1 yard Smith Concrete Mixer and 9 x 9 Wache Vertical Steam Engine direct connected, also Hopper, Galvanized Iron Cylinder, Pipe and Fittings from Boiler.
1	Vertical Boiler, 25 H.P., 42 x 96, 148 lbs. working pressure will all fittings and Stack.
2	Cement Blowers.
1	Scow 27 x 90 with Sheds and Timberwork.
1	7 x 10 Double Drum Hoisting Engine. Timber Work for underwater Concrete guides also skid for 7 x 10 Engine.
1	12" Vertical Centrifugal Pump with 40′ Shaft, Bearings, Guides, etc., also Timber Work.
1	12 x 8 Atlas Steam Engine.
1	piece 16" Double Leather Belt, etc. { 48 ft. Rubber 40 ft. Balatta Type 22 ft. Leather
1	72 x 108 Vertical Boiler.
1	No. 1 Union Iron Works Steam Hammer.
1	Diving Outfit complete, Pump, Scow, etc.
3	Diving Suits.
1	Derrick Scow complete, equipped with 9 x 10 American Hoist and Derrick Engine, also swinging Engine and all Fittings including Ejector, Westinghouse Air Compressor.
1	1-Yard Orange Peel Bucket.
1	Small Scow.

For further particulars and prices apply to the City Purchasing Agent, City Hall, Victoria, B.C.

E. S. MICHELL,
42-45 Purchasing Agent.

TENDERS

Fire Station, Lambton Mills

Sealed tenders, separate or bulk, plainly marked as to contents and addressed to the undersigned will be received up to 5 o'clock P.M.,

Monday, November 5th, 1923,

for the erection of a Fire Station at Lambton Mills, Ont.

Plans and specifications, tender forms and all information may be obtained at the office of the Engineer of the Township of Etobicoke, Islington, Ont.

A deposit of $5.00 is required to assure the return of the plans.

The lowest or any tender not necessarily accepted.

S. BARRATT, Clerk,
Islington, Ont.

44

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, November 6th, 1923,

for

(1) Ornamental Iron, Marble, Panting and Glazing for EARL HAIG SCHOOL.
(2) Plastering, Marble, Asphalt Mastic Exhaust Ventilation for RIVERDALE COLLEGIATE.
(3) Painting and Glazing, Asphalt Mastic, Fibre Mastic for LANSDOWNE SCHOOL.
(4) Concrete Wall for FERN AVENUE SCHOOL.

Specifications and conditions for tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

F. E. POWELL,
Chairman Property Committee.
W. W. PEARSE,
Business Administrator and Secretary-Treasurer.

44

Business Opportunity

A well established contracting and building firm desires to expand. Has work ahead and in view that will be very profitable. Solicits correspondence with contractor, builder or other parties with good financial standing. Apply Box 399, Contract Record, Toronto. 42-45

Rock Excavation

I have the necessary machinery and equipment for all kinds of Rock Excavation. Am now open for contracts or sub-contracts with or without machinery. 15 years experience.

Wm. Bullard, Box 586, Burlington, Ont. 43-44

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls

28-t.f.

Dump Cars and Locomotive For Sale

6—16 yard Western air dump cars, wood bottom, steel sides and steel lined bottom, now in use at Port Weller, Ontario, on the Welland Ship Canal, hauling sand only, are nearly new and in first class condition.

Pennsylvania Switching engine, type 0-4-0, 144-2" diam. tubes, boiler pressure 160 lb., cylinders 17" x 24", electric head lights front and rear, driving wheel 44" diam., brake and straight air for dumping cars, tender 2700 gallons, coal 8000 lbs., weight 40 tons.

The above plant now in use and will be sold subject to delivery F.O.B. tracks Merritton, about November 20th, 1923.

National Sand and Material Co., Limited

Welland, Ontario

44-46

Dredge for Sale

All steel machine, ¾ yd. dipper, 30 ft. steel boom, 30 ft. steel axles, 35 H.P. Gas Engine.
O. M. Loyer, 119 Harvey St., Chatham, Ont.
42-44

Parsons Trenching Machine

Model 36, digs 36 inches wide and 15 feet deep. Machine in good condition and has been used very little.
Charles R. Lennane & Co., 2631 Woodward Ave., Detroit, Mich. 43-44

Steel Sheet Piling for Sale

214 Pieces New Lackawanna Steel Sheet Piling 18 feet long, 14" x 3/8" Arch Web, Weight 40.8 lbs. per lineal foot.
Second Hand Lackawanna Steel Sheet Piling Same Section and weight—good condition.
109 Pieces—15 to 25 feet long.
102 Pieces—20 feet long.
8 Corners—20 feet each.

PORT ARTHUR CONSTRUCTION CO., LTD.
611 Excelsior Life Bldg., Toronto.
44-45

Floating Derrick Wanted

Wanted to purchase: Second hand floating derrick about 5 tons capacity, 30 ft. boom.
A. F. Fifield, St. Catharines, Ont. 44

CONTRACTOR'S SUPERINTENDENT requires position—well up in reinforced concrete and all classes construction—life long experience—excellent references. Apply Box 412, Contract Record, Toronto. 44

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-45

SITUATION WANTED BY ARTIFICIAL STONE EXPERT whose 14 years experience covers every detail of the stone business—estimating, pattern-making and stone-making. All classes of work from blocks and posts to the highest class of architectural stone. Box 402, Contract Record, Toronto. 42-44

Residences

CONTRACTS AWARDED

(Continued from page 51)

Sandwich, Ont.

J. L. Seiber, Windsor, Ont., has the contract for plumbing and heating of $12,000 residence on Partington Ave., being built by F. Prince, Windsor, owner and general contractor. Electric and plastering to be let.

The walls are going up for $14,000 duplex residence on Partington Ave. Prince Bros., Davis Bldg., Windsor, are the owners and general contractors. Electric—Windsor Electric Shop; painting—National Painters & Decorators. Plastering to be let.

Toronto, Ont.

The following sub-trades have been let on $18,000 residence and garage north side Austin Terrace and Lyndhurst: drains—J. Martin, care general contractors, Graham & Sibbett; plumbing—I. Maude, 18 Rowland Ave.; heating—J. A. Pountney, MacKay Ave.; plastering—Hamilton & Jackson; painting—Chas. H. Prince, 304 Kenilworth Ave.

J. Elliott, 98 Concord Ave., has the contract for plumbing for $8,500 residence on Weyburn Crescent. J. H. Wills, 412 Ossington Ave., is the owner and builder. Architects, J. Hunt Stafford & Son, 67 Yonge Arcade.

W. D. Butt, 33 Gwynne Ave., has the contract for plumbing and heating for $10,000 duplex residence south side Patterson and Glendale Aves. A. H. Forster, 118 Glendale Ave., is the owner.

R. Mowbray, 425 Russell Hill Rd., has the general contract for $12,000 residence south side Teddington Park Ave., near Yonge St., for A. Reid, Regal Road. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects.

Excavating work is being done for 4 stores and apartments north side Danforth, near Caithness Ave. S. H. Lumb, 31 Oakdene Crescent, is the owner and builder, and buys material as required. Masonry—Wm. Pugh, 1252 Broadview Ave.; steel — McGregor & McIntyre, Ltd.; painting, heating, electric plastering and plumbing to be let by owner.

The following sub-trades have been let on 3 residences west side Glenmount Park Rd., near Burgess Ave., being built by Westwater & Sharp, 158 Langford Ave.: electric—T. B. Kilner, 601 Jones Ave.; plumbing—P. Reading, 71 Marjory Ave.; heating T. Eaton Co., Ltd.; plastering—owner by day labor; painting—Chas. Hamilton, 50 Devon Rd.

Woodhouse & Dickinson, 2537 Danforth Ave., are the owners and builders of 3 pair residences, $18,000, north side Milverton Blvd., near Woodington Ave. Electric—Nichol & Fagin, 111 Logan Ave.; plumbing — F. O. Swan, 1962 Gerrard E.; heating—Pollard & Dilks, 54 Gledhill Ave.; painting—R. W. Jarvis, 23 Chester Ave.; plastering—Jno. Kee, 461 St. Clarens Ave.

W. Adams, 103 East Lynn Ave., has the contract for 1 pair and 1 single residence, $12,000, on south side Poulton Ave., near Woodbine. C. Gibbs, 11 Albermarle Ave., is the owner and builder. Painting, day labor by owners own staff. Plastering let.

J. Murray, 367 Poulton Ave., is the owner and builder of 3 pair residences, $18,000, north side Poulton Ave., near Woodbine. Electric — Mr. Washington, 810 Danforth Ave.; heating—Mason & Allen, 400 Morley Ave.; plastering—I. Black, painting — Mr. Dowling, care owner. Plumbing trade has been let.

Vancouver, B. C.

The following sub-trades have been let on $60,000 apartment block being built corner 12th Ave. and Alder St., for Wm. Walker & Co., Granville and 52nd St.: millwork—Jas. Brooks, Granville Island; electric—Frank Lake, 1619 53rd Ave. E.; plumbing — W. A. Brown, Ltd., 331 Georgia St.; heating—Walker, Leek & Co., 1090 Homer St. General contractors, John Galloway & Sons. Architects, McCarter & Nairne.

Power Plants, Electricity and Telephones

Batiscan, Que.

North Shore Power Co., Three Rivers, Que., contemplate hydro electric power house and mills to develop 5,000 horse power.

Temiscamingue, Que.

The erection of mills and electric power house on Megiscan River to develop 22,000 horse power is contemplated by L. N. Huart, Commercial St., Levis, Que., the owner.

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for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives

Fidelity Insurance Co. of Canada

STANLEY [illegible] MANAGER

FIDELITY AGENCY OF CANADA LIMITED

THIRTY SIX TORONTO STREET

Wheatly, Ont.

The village council has passed a by-law for hydro power to cost $13,000, and power line at $22,000.

CONTRACTS AWARDED

Brampton, Ont.

Foundations are going in for $12,500 telephone exchange. M. C. Sackrider, Brampton, is the general contractor; plumbing and heating — Higgins & Large. Masonry, roofing, sheet metal, plastering, painting and electric to be let by general contractor. Architect, W. J. Carmichael, 118 Notre Dame St. W., Montreal.

Hemmings Falls, Que.

Southern Canada Power Company have awarded the contract for six 4,750 kv.a. vertical type generators to the Canadian General Electric Company. Two of these machines are 30 cycle and four of them 60 cycle. The Canadian General Electric Company have also received the order for twelve 2,000 kv.a. transformers. This equipment is all in connection with the Southern Canada Power Company's hydro-electric development at Hemmings Falls, near Drummondville, Que.

Newfoundland.

The Newfoundland Power & Paper Company recently awarded contracts to the British Thompson-Houston Company, for the generators for their new hydro-electric system. The Canadian General Electric Company are supplying the transformers to the number of 31, with a total capacity of 170,000 kv.a. This contract was let through the W. G. Armstrong - Whitworth Co., who are general contractors on this development.

Port Hope, Ont.

Garnet & Sons, Port Hope, have been awarded the general contract, including heating and plumbing, for telephone exchange to be built here.

Trent River, Ont.

Hydro Electric Power Commission of Ontario, have awarded the general contract for excavating tailrace channel (Dam No. 9), to the Lumsden Engineering & Transport Co., Toronto.

Weston, Ont.

The foundations are going in for $40,000 telephone exchange on Mill St. Heating and plumbing—Keyes & Bull, Weston. General contractors are Wells & Grey, Ltd., Toronto.

Miscellaneous

Cannes de Roches, Que.

Tenders are being received till November 15, by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for breakwater extension. Plans and specifications at Department, offices of district engineers, Lower St. Lawrence Power's Bldg., Quebec, Que., and at Post Office, corner of the Beach, Gaspe Co., Que. A 10% accepted cheque required.

New Westminster, B.C.

Tenders will be received by Dept. of Public Works, Ottawa, Ont., through the secretary, R. C. Desrochers, till November 20, for the construction of 1600 feet of bank protection for West Nicomen Island in the Fraser River. Plans and specifications with Dept. of Public Works, Ottawa, Ont.

CONTRACTS AWARDED

Belle River, Ont.

Detroit River Construction Co., Windsor, have the general contract for protection wall at $27,663.

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MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

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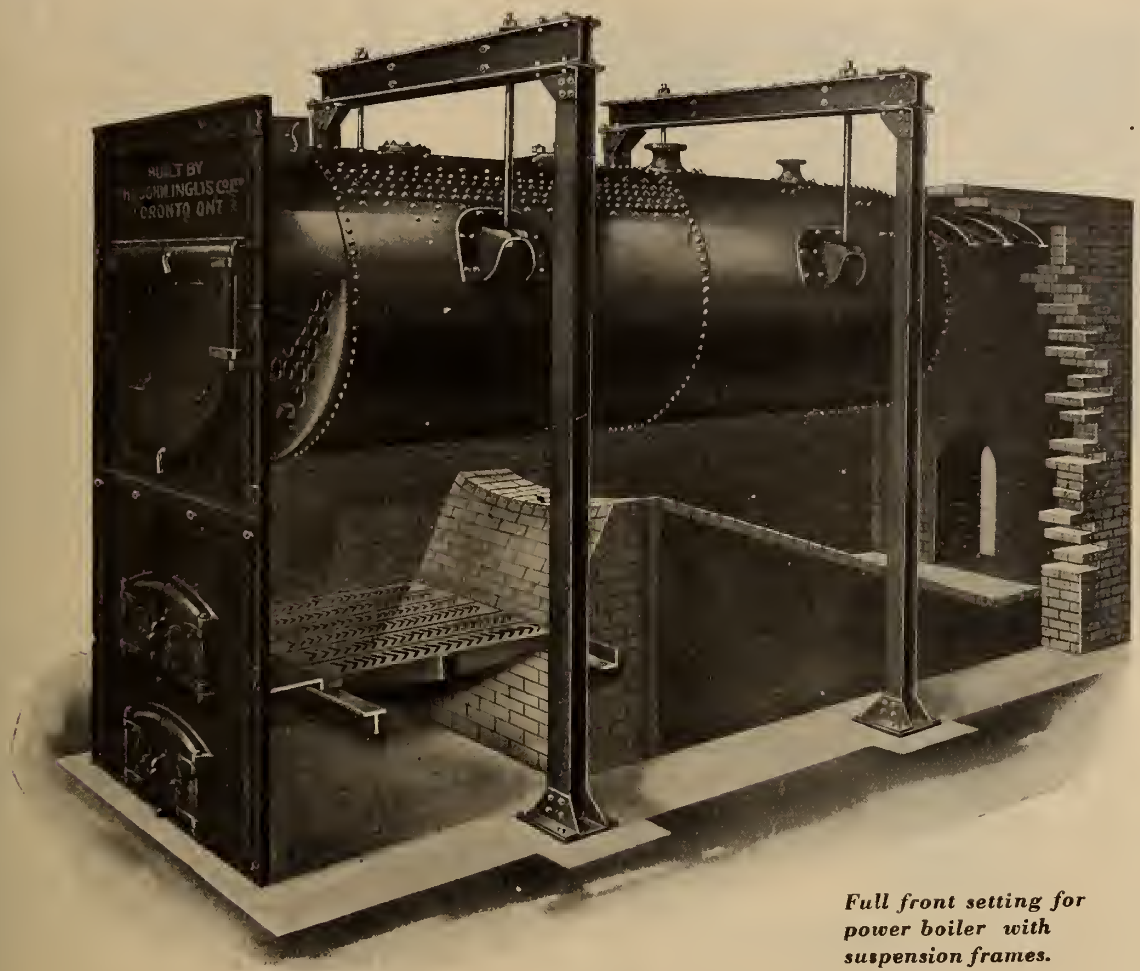

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Late News

Brantford, Ont.
Chas. Taylor & Co., 12 Dalhousie St., have the contract for plumbing in connection with $15,000 warehouse, office and garage on Burford Rd. General contractors, P. H. Secord & Sons Contracting Co., Ltd. Consulting Engineer, W. A. T. Shorman, care owners, British American Oil Co, Ltd., Toronto.

Corbyville, Ont.
The following sub-trades have been let on $225,000 distillery buildings for Canadian Industrial Alcohol Co. Ltd.. reinforced steel—Canadian Bridge Co., Walkerville; millwork—Arthur Keefer, Belleville; roofing—A. R. Moore, Peterboro; plumbing and heating—John Lewis & Co., Belleville; fire doors—Pedlar People, Ltd.; metal sash—Canadian Metal Window & Steel Products Co., Ltd., Toronto. Tenders are being received by the general contractors, A. F. Byers & Co., Ltd., 340 University St., Montreal, for the erection of structural steel on alcohol and mixing buildings. Engineers are T. Pringle & Son, Ltd., Montreal, Que.

Hamilton, Ont.
Donaldson & Patterson, 229 Bay St., have the general contract for $15,000 store and office building corner Kenilworth and Barton Sts., owned by Miss McNab, 136 Robinson St. General contractors are looking after all sub-trades and buying materials.

The city council has awarded the contract for laying wires underground to Northern Electric Co. Ltd., and Standard Underground Cable Co. of Canada; fire alarm boxes—Northern Electric Co. at $5,104. cable contract—Standard Undrground Cable Co. of Canada; placing cables in conduits—local Hydro-electric Dept.

Montreal, Que.
The foundations are in for 6 residences and 4 garages, $50,000, on Van Horne nar Rockland. Guidazio & Besozzi, 64 De L'Epee Ave., are the owners and builders. Architects, Perreault & Gadbois, 2100 Park Ave. Brickwork, millwork, roofing, electric, plumbing, heating ,plastering painting and glazing, an tiling to be let.

Outremont, Que.
Guidazio & Besozzi, 640 De L'Epe Ave., have the general contract for $250,000 public garage north west corner Bernard and De L'Epee, for J. O. Villeneuve & Co., 763 Bloomfield. No materials purchased. General contractor buy.

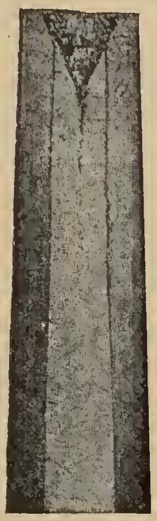
Guidazio & Besozzi, 640 De L'Epe Ave., are the owners and builders o $100,000 apartment house corner Laurie and Querbes. Millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, tiling and ornamenta iron to be let. Na materials purchase

Toronto, Ont.
The walls are going up for 2 residences, $20,000, east side Springmount nea Regal Road, owned by Geo. B. Patto 36 Regal Rd. Architects, J. Hunt Stanford, 67 Yonge Arcade, Toronto. Tenders are being received on plasterin electric, plumbing, heating and paintin trades.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

Steel ingots which has been cut in half showing the "pipe" in the centre and the porous segregated portion at the top. In the manufacture of rail steel the ingot is carefully cropped to remove all pipe and segregation, thus insuring a steel of the highest quality.



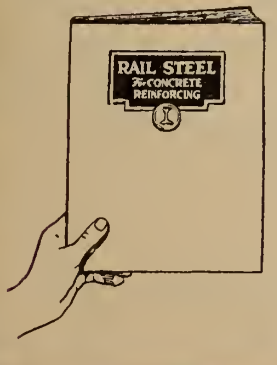
Quality and Metal Fatigue

The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation,, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity, and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in exactly the same condition as it was prior to its years of service.

RAIL STEEL BARS rolled from railroad rails have provided a concrete reinforcement of quality—quality obtained through care in manufacture—a degree of quality possessed by no other reinforcement steel.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14.



Send for This Valuable Booklet—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20

LIME		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.50 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS:—.Discount on flue linings is 55%

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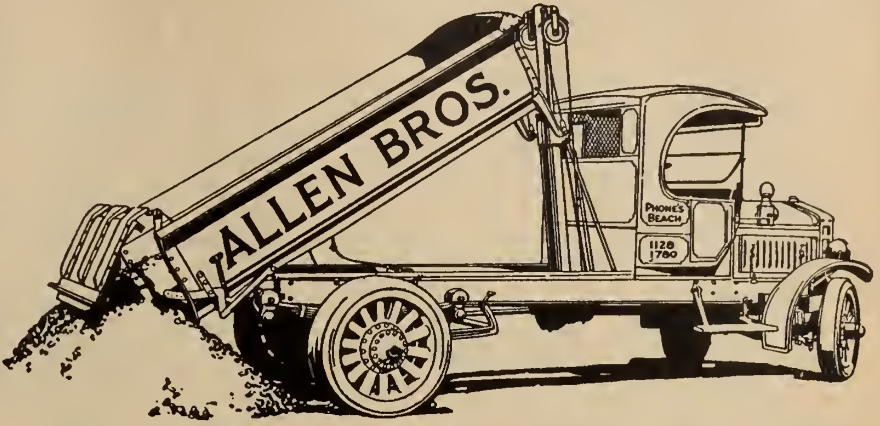

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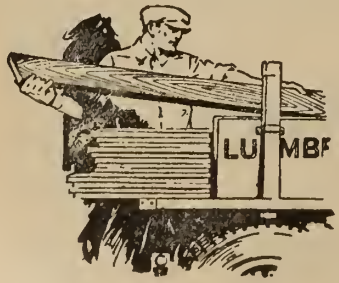
CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	125.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	**per hr.**	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	**per hr.**	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.



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—"Contract Record"—October 10th, 1923.

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Figs. 345 and 400 "F. M."

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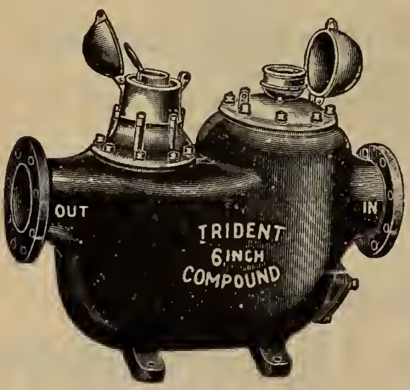

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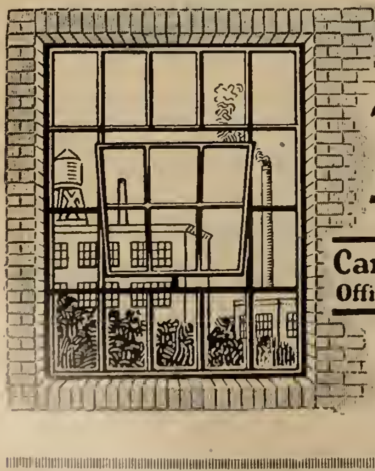

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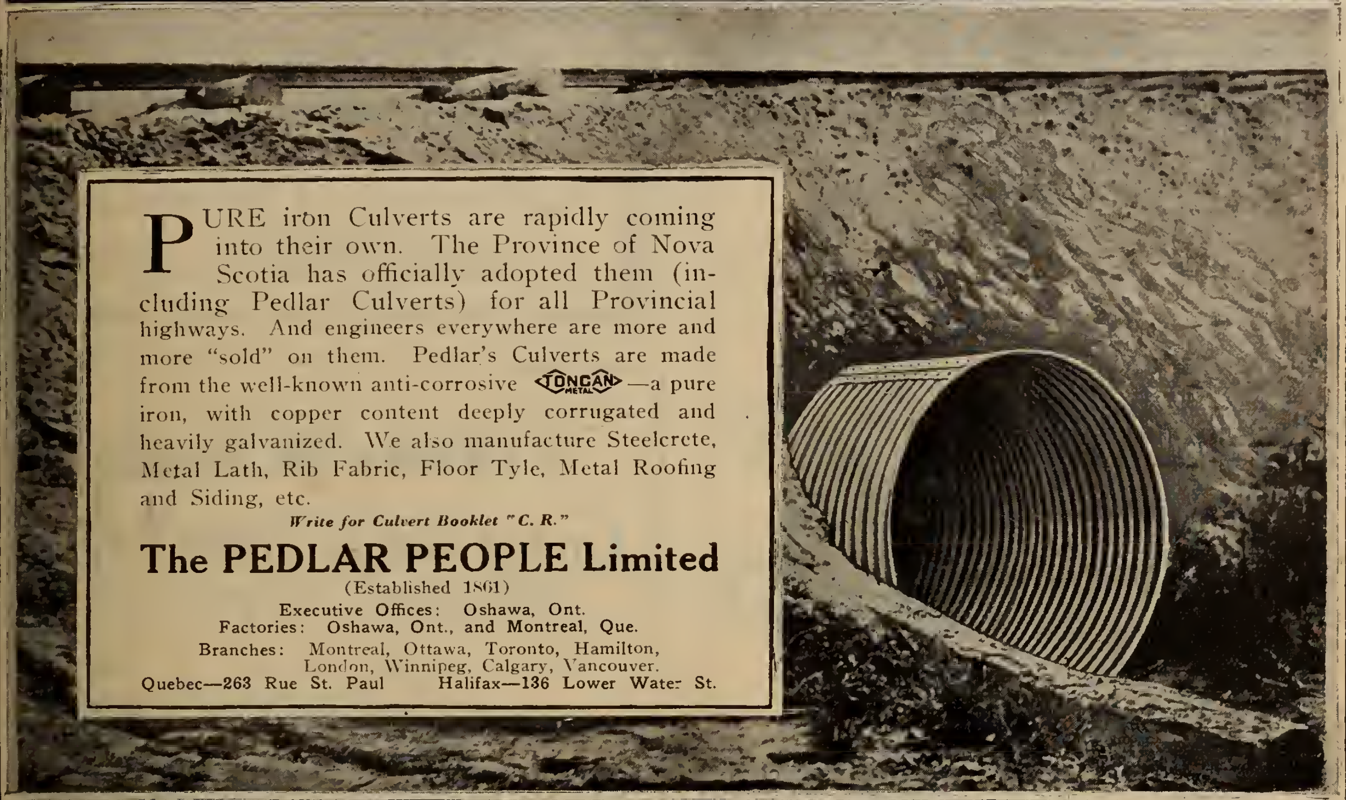

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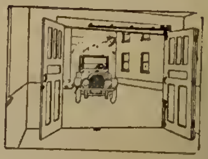

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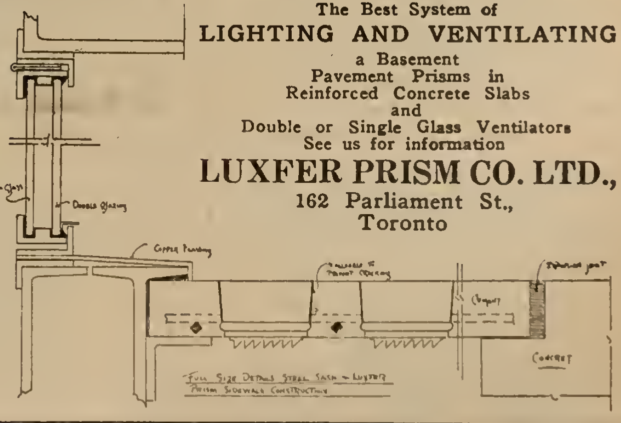

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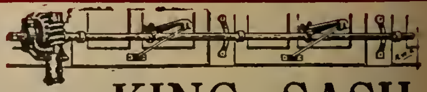

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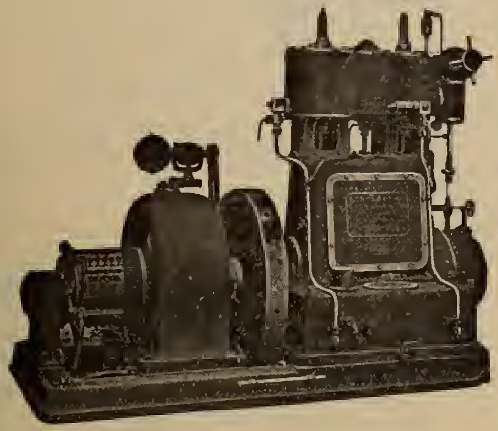

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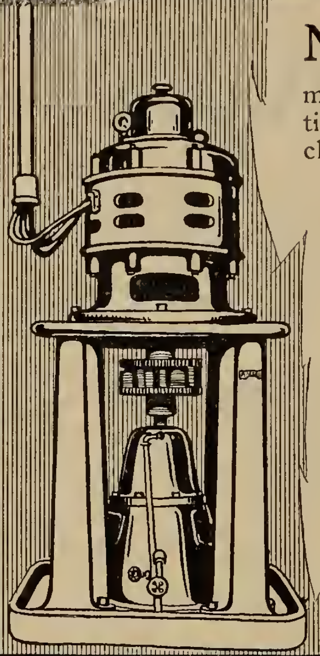

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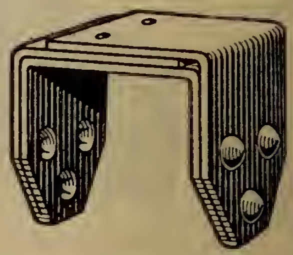

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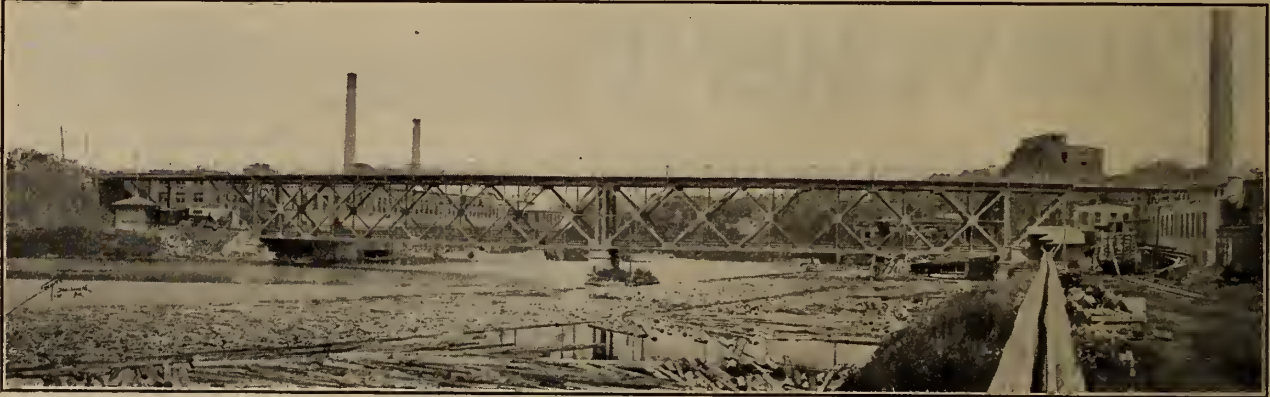

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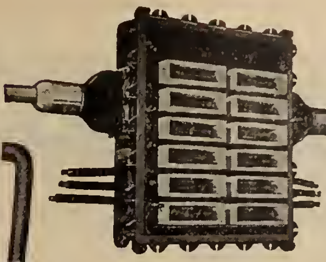

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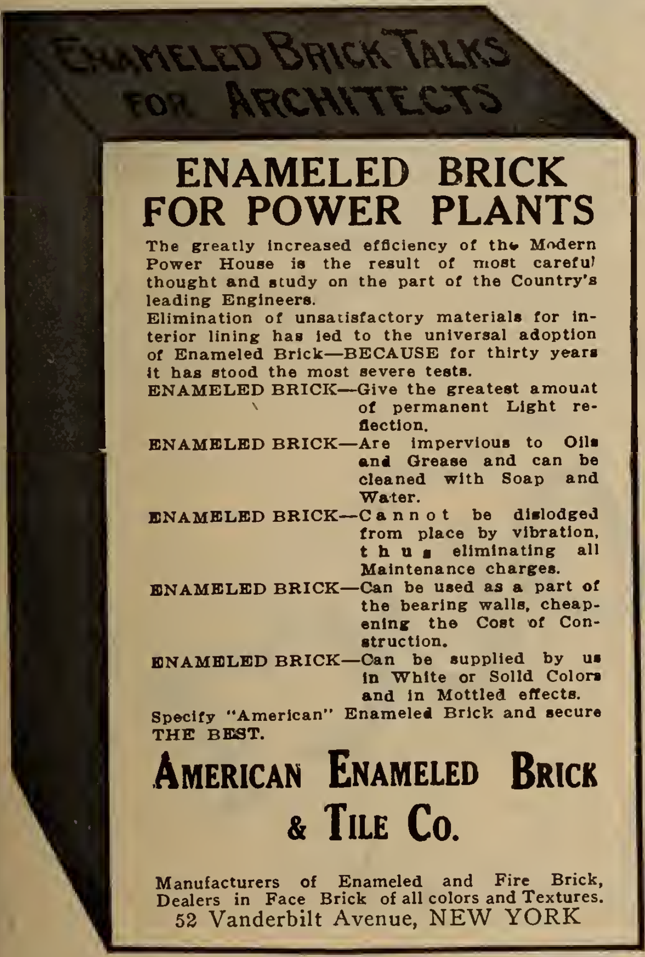
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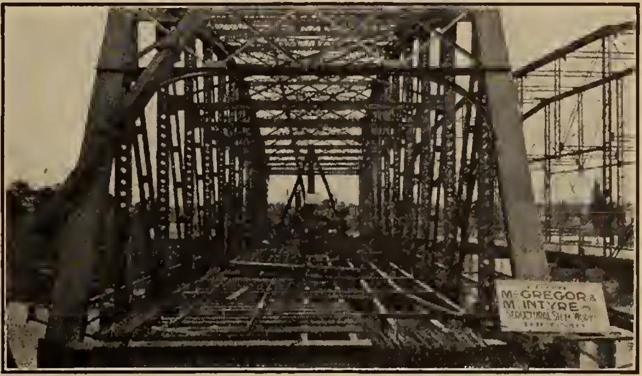

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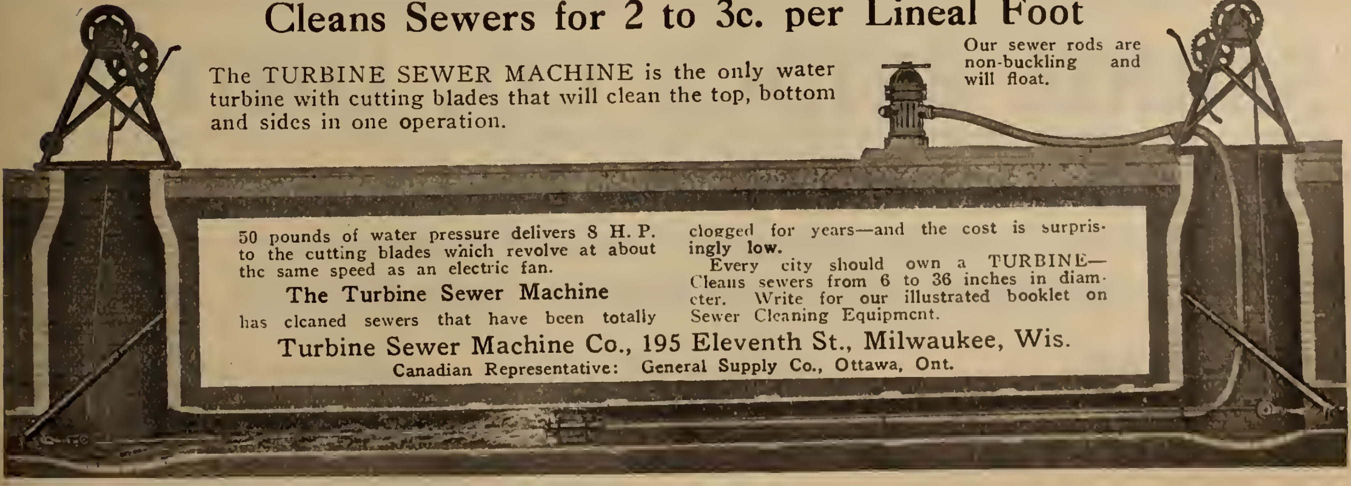

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THE FIREPROOF VENTILATING FLOORING
282

**STANDARD STEEL
CONSTRUCTION CO. LTD.**
WELLAND ONTARIO

Lamatco
3 PLY COTTONWOOD VENEER PANELS

"The Universal Wallboard"

Lamatco is Made

of three layers of cross grained cottonwood veneer cemented together with our special waterproof glue and patented hot plate process.

Full particulars can be had from

John B. Smith & Sons
Toronto — Ont.

Laminated Materials Co. Ltd.
New Westminster, B. C.

The Canadian Bridge Co., Limited

Main Office and Works: - - - Walkerville, Ontario

Designers, Manufacturers and Erectors of
STRUCTURAL STEEL WORK

Railway and Highway Bridges
Locomotive Turntables and Train Sheds
Office Buildings and Manufacturing Plants
Crane Girders and Runways, Coal and Ore Handling Bridges

Grain Elevators, Storage Bins and Conveyor Bridges
Tank and Plate work, of all kinds
Blast Furnaces, Ore Bins, Coal Bins
Lock Gates, Regulating Gates, and Penstocks
Plain Structural Material furnished from stock

An adequate engineering staff is prepared to advise and to co-operate with prospective clients by furnishing specifications, designs, estimates reports and tenders.

Special Attention Given to the Design and Manufacture of
ELECTRICAL TRANSMISSION TOWERS

Sales Offices:
New Birks Building, MONTREAL, P.Q.
Huron & Erie Building, WINNIPEG, MAN.
Tegler Building, EDMONTON, ALBERTA

Sewers
and
Culverts
built from
Our Concrete
give maximum service
at minimum cost
(Large Stock on Hand)

Write us for Catalogue and Prices

Dominion Concrete Co. Limited
KEMPTVILLE - ONTARIO

This year
for
WATER MAINS
use
Made - in - Canada

P♔H Bell and Spigot Steel Pipe
Dipped and Wrapped

P♔H Bell and Spigot Steel Pipe

Sizes from 3 inches to 10 inches in Diameter

For complete information regarding the large saving in using and its many advantages over cast-iron pipe, communicate with

PAGE-HERSEY TUBES, LIMITED
100 CHURCH ST. TORONTO, ONT.

Robert W. Hunt & Co.
Limited

Consulting and Inspecting Engineers
Chemists and Metallurgists.

Expert inspection and tests on all materials and equipment.

Parties having Relaying Rails, Cars, Locomotives and other used equipment for sale, are invited to list same with us, in view of various enquiries from clients for such information.

Head Office and Laboratories: McGill Bldg., Montreal.
Branches throughout Canada, United States and Europe.

Fabricated Steel

CANADIAN TANKS DES MOINES TRADE MARK

We design, fabricate and erect steel structures to meet your needs. DES MOINES erection crews have become experts through years of experience.

Canadian Des Moines Steel Co., Ltd.

267 Inches Ave., Chatham, Ont *64 St. James Street, Montreal, Que.*

CANADIAN DES MOINES

We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
Harbours	**Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.

Engineers and Contractors

Head Office: Lumsden Bldg., Toronto

O. S. DEPENDABLE LOCOMOTIVE CRANES

Clam Shell and Orange Peel Buckets

are designed and manufactured to give the service your business demands.

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CATALOG NO. 18 SENT FREE OF CHARGE

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J. G. Allan, President
James A. Thomson, Vice-President

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.
LIMITED

MANUFACTURERS OF

Flexible and Flange Pipe and Special Castings

Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
for Water, Gas, and Culvert

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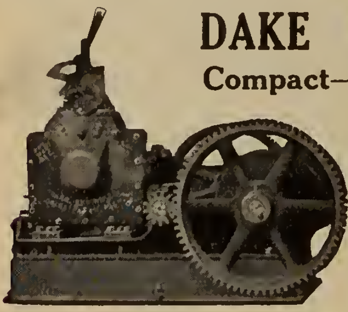

DAKE MACHINERY
Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.
Canadian Office 45 Adelaide St., E. Toronto, Ont.
Capt. Wm. Stitt, Can. Sales Mgr.

Pacific Coast Pipe Co., Ltd.
Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter
Continuous Stave Pipe
from 16 in. to 12 ft. diameter
1551 Granville Street - Vancouver, B.C.

"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

INTERNATIONAL ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
Company, Limited
300 Campbell Avenue, Toronto

CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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Works at: Fort William, Ont., St. Thomas, Ont.
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The smooth, quiet operation of Turnbull Elevators made them the logical choice for this Doctors and Dentists Building.

The Medical Arts Bldg., Montreal
General Contractors: The Foundation Co.,
Architects
Ross & MacDonald.

Equipped with
TURNBULL ELEVATORS

The
TURNBULL ELEVATOR COMPANY
LIMITED

HEAD OFFICE & WORKS:
John st, TORONTO.

MONTREAL BRANCH:
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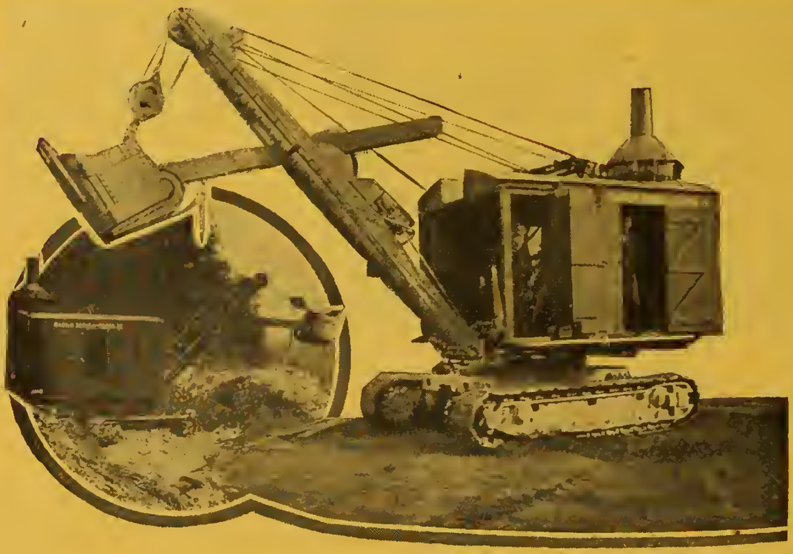
"Dominion" Wire Rope

Flexibility and Strength
for the
Stiffest Requirements

Let us quote you for
BLOCKS, CLIPS, THIMBLES AND SHACKLES

THE DOMINION WIRE ROPE CO., LIMITED
Head Office MONTREAL Also at: TORONTO, WINNIPEG



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MARION STEAM SHOVELS
"INDUSTRIAL" PILE DRIVERS
AND CRANES
JORDAN SPREADERS
"RANSOME"
CONCRETE MIXERS

Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, November 7, 1923 No. 45

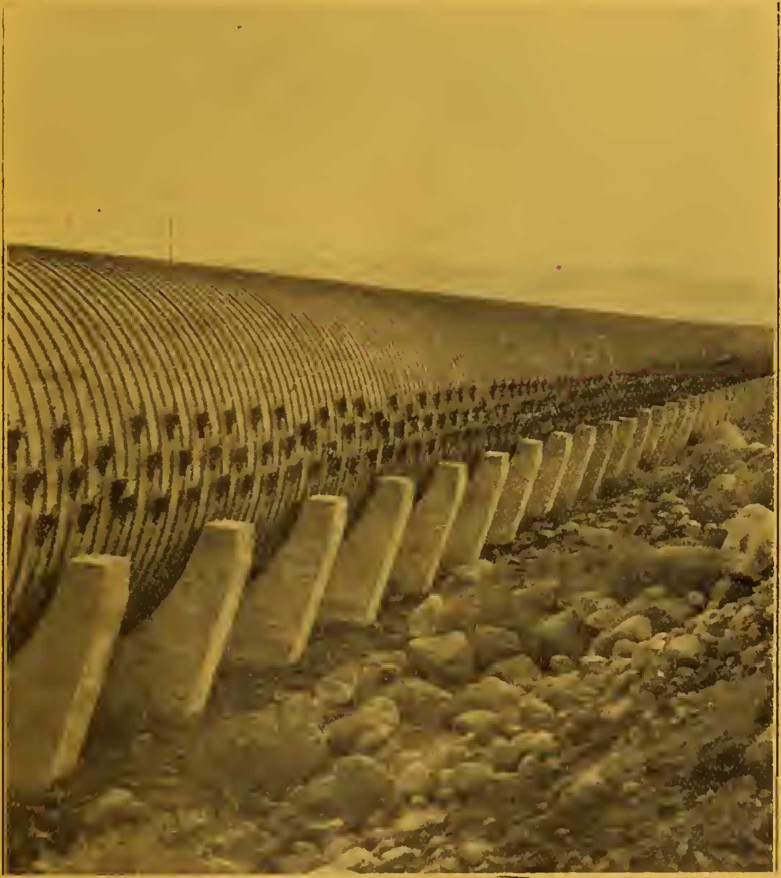
Contract Record and Engineering Review

Pacific Coast Pipe Co., Limited

1551 Granville Street Established 1904 Vancouver, B. C.

The benefit of years of experience in Wood Stave Pipe installation is at your service

Write us for Catalog and Estimates



11 ft. dia. Pipe with Special Concrete Cradles

The Combination of Wood Stave Pipe and Concrete Cradles we illustrate here stand for Durability and Economy

Wood Stave Pipe

Wire Wound Pipe
2 to 24 inches diameter

Continuous Stave Pipe
16 inches to 14 feet diameter

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

REES RoTURBo

Self Regulating PUMPS

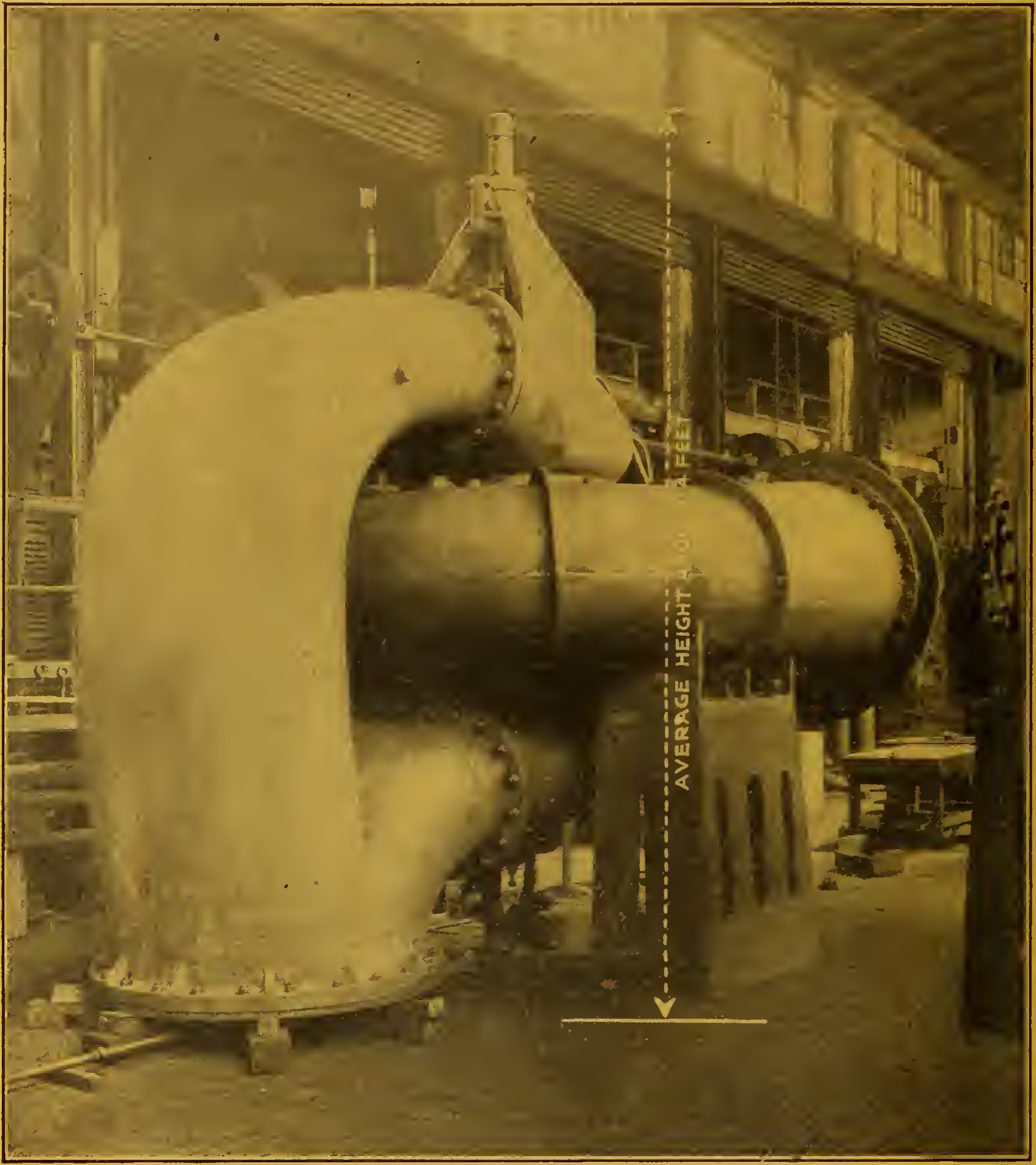


Illustration shows one of TEN REES RoTURBo PUMPS installed or on order for The St. John Drydock & Shipbuilding Co.

The three main pumps, "one of which is shown above" have an average capacity of over 250,000,000 Imperial Gallons per 24 hours and a maximum capacity of over 300,000,000 Imperial Gallons per 24 hours.

Ask for the REES Catalogue and any desired information.

THE GOLDIE & McCULLOCH COMPANY, LIMITED

Head Office and Works, GALT, Ontario, Canada

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Montreal, Que.

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Winnipeg, Man.

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Suite 1101-2
Bank of Hamilton Bldg.

BRITISH COLUMBIA AGENTS:
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Vancouver, B. C.

Concrete Blocks, Brick and Culvert and Sewer Tile

are staple articles. Thousands of contractors who operate their own plants have found this the most profitable branch of their business. It provides work for their men during winter months and will provide a source of income the year around.

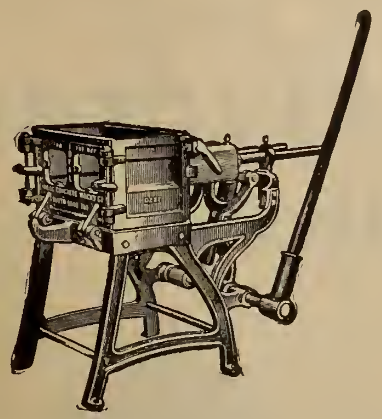


Fig. 910

IDEAL CONCRETE BLOCK MACHINES THE WORLD'S STANDARD

The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.

The Ideal Block Machine makes every style of block required.

—Fully described in Catalogue No. 22-B-1

The Ideal Concrete Block stands supreme the world over. They are made in any size, shape or design to suit the most exacting Architect or Engineer. One of the most recent developments is that of making blocks to receive stucco finish, which is very popular in house construction.

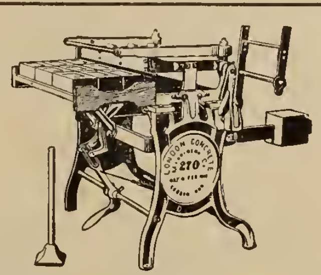


Fig. 91

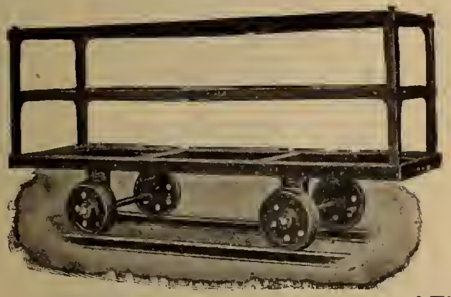
LONDON CEMENT BRICK MACHINE

Hand Power

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression.

This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.



We Make a Full Line of Brick, Block and Tile Cars. Prices on Application

—Fully described in Bulletin No. 17

Cement Brick are in good demand in many localities where building materials are required. They are suitable for all classes of construction and can be profitably made without a large expenditure.

LONDON CULVERT TILE AND WER-PIPE MOULDS

Made in all Sizes From 4 in. to 72 in.

Our moulds are made on designs approved by Engineers. There are large profits in making Culvert Tile and Sewer Pipe.

—Described in Bulletin P-1.

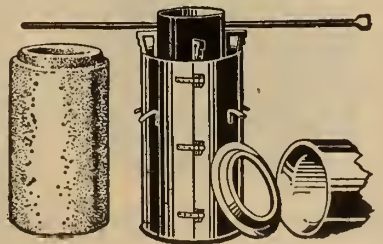


Fig. 95.

London Tile and Sewer Pipe Moulds have been used to make concrete tile for every large Municipal Sewer contract in Canada within recent years. They make tile in all sizes from 4 inches up to 10 feet in diameter.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7, London, Canada

World's Largest Manufacturers of Concrete Machinery

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Building Products & Fuel Ltd., Saskatoon, Sask.
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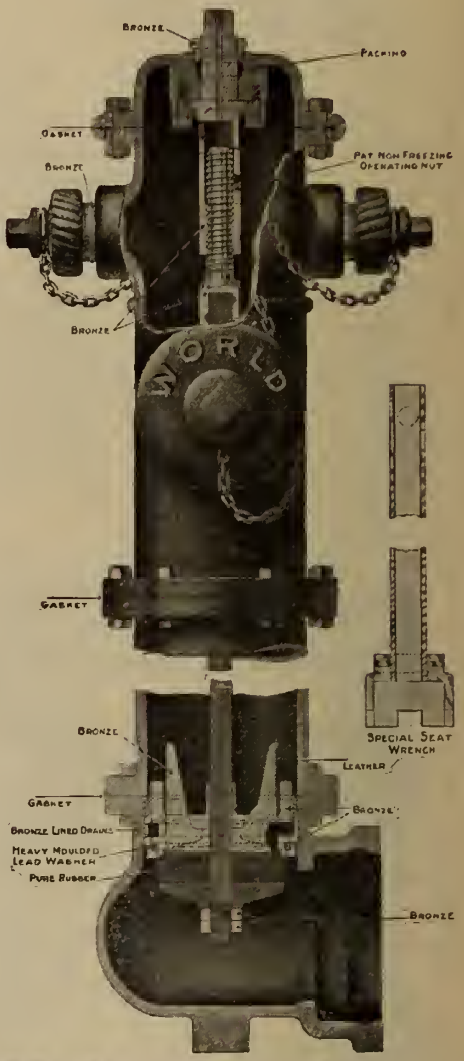
Whitelock & Marlatt, Moose Jaw, Sask.
West Kootenay Equipment & Construction Co., of Nelson, B.C.

"World" Fire Hydrants
and Gate Valves

"WORLD" Hydrants and Valves have been the choice of engineers and municipal officials for nearly one hundred years. Today they are in service in every province in Canada and their numbers increase steadily.

Only products of exceptional merit could boast such a record.

"World" Hydrants are "right"—in design, in materials, in workmanship. Make them your choice and you'll never have cause to regret it.



Catalogs, prices and full details are yours for the asking.

The World's Standard Since 1834

TRADE WORLD MARK

McAVITY'S GUARANTEE

"Demand The Brand"

T. McAvity & Sons. Ltd.

Valves Fittings & Supplies

Goods Guaranteed Good BY Almost a Century's Experience ESTD. 1834

St. John, N.B. Canada.

McCRACKEN SEWER PIPE

Is Winning Canada's Favor

Ottawa Saves $8,000 on Sewer Pipe

Mr. A. F. Macallum, Commissioner of Works, Ottawa, Ont., replies to published criticism of the action of city council in adopting the Macallum recommendation for concrete pipe as against vitrified clay pipe. (See Ottawa Citizen, April 26th, 1923.) Mr. Macallum's letter to the Board of Control reads:

"It may be taken for granted that there are no acids in comparatively fresh sewage in this city to disintegrate concrete pipe made to our specifications under inspection and properly cured and tested regardless of the absurd statements made by the clay pipe people.

"Concrete pipe was easily made by small plants in a careless manner and as a consequence engineers have been prejudiced against it until recently, when first class pipe in the smaller sizes has come on the market. For that reason we have not used it in this city for the sizes from 24 inches to 6 inches until recently, giving a monopoly practically to clay pipe.

"It is interesting to note then the difference in prices in 1921 (when there was no concrete pipe tender) with 1923.

CLAY PIPE TENDERS

	1921	1923
6 inch	.32½	.23
9 inch	.59	.41
12 inch	.91	.67
15 inch	1.20	.85
18 inch	1.70	1.27
24 inch	3.10	2.15

"In other words if we had not allowed tenders from the concrete pipe people we would have had to pay about $25,000 instead of $17,000 for this year's supply of pipe."

Write for complete information and quotations

Jno. E. Russell Company, Limited

General Sales Agents
Harbor Administration Building, Toronto

McCRACKEN
SEWER PIPE
"The Pipe That Endures"

McCracken Concrete Sewer Pipe is manufactured in accordance with standard specifications issued by the American Society for Testing Materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

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- Air Compressors
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  - Canadian Blower & Forge Co.
- Dredges
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Drills
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co
  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
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  - Dominion Bridge Co., Ltd.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

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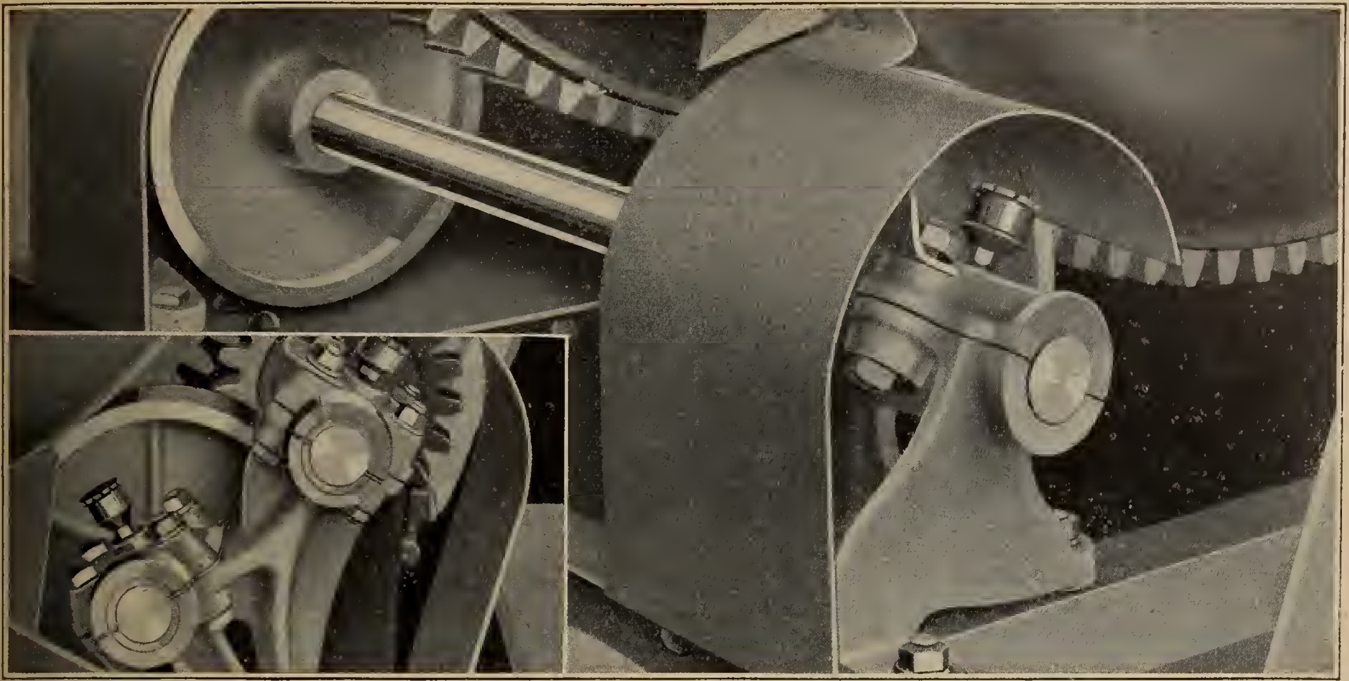

Bearings First!

GO straight to the drum roller bearings to discover fundamental merits or demerits of a paver. No matter what the "features" elsewhere, fundamental weakness in drum roller bearing construction means wobbly drums, pounding vibrations, frame distortions, disalignments, and metal crystallization, all of which are the principal causes of breakdowns in every part of the mixer, of costly delays, high maintenance and short service life.

Koehring drum roller bearings are the freight car truck type which good mechanical engineering always specifies for heavy load carrying service. The rollers are *fixed* to the shafts and the *shafts* turn in big over-size, adjustable, renewable bearings on the main frame. They *always* present a *full even* bearing face—always can be *perfectly lubricated.* No *possibility* of unequal wear that causes drum wobbling, that flattens shafts, and makes lubricating impossible.

Koehring Capacities

Pavers, 7, 10, 14, 21, 34, cu. ft. mixed concrete. Write for Catalog P-34

Heavy Duty Construction Mixers, 10, 14, 21, 28 cu. ft. mixed concrete. Write for Catalog C-34

Dandie Light Mixer, 4 and 7 cu. ft. mixed concrete. May be equipped with power charging skip, low charging platform, water measuring tank. Light Duty Hoist. Write for Catalog D-34

KOEHRING COMPANY OF CANADA, LIMITED,

105 Front St. East,
Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Quebec
Phone: Uptown 3026

E. N. & W. E. Soper, 63 Sparks St., Ottawa, Ont. Phone: Queen 3435

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Electric Fans
Canadian Blower & Forge Co.
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Elevator Doors
Ormsby Company, A. B.

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Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

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American Enameled Brick & Tile Company

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Canadian Ingersoll Rand Co.
Clyde Iron Works
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Laurie & Lamb
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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
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Thew Shovel Co.

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Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.
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Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

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Laurie & Lamb

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National Fireproofing Co.

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Jenkins Bros. Ltd.

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Brantford Sand & Gravel Co.
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Mercer Bros.

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Canadian Austin Machinery
Canadian Equipment Co.
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McGovern, T. J.
Mussens Limited
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Meters
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Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Inglis Co., John
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Imperial Oil Company, Ltd.
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Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

ERIE Revolving Shovels

"We cut an excellent slope on the banks," write the contractors, Geo. B. Herring & Son, Mansfield, Ohio, in commenting on the above photo.

Profitable Winter Work

Maybe you can find work like this to hold a good crew during cold weather, and make some money too.

Every "B" Erie shovel or Crane can be easily changed over to a dragline excavator. The Erie Dragline shown here is widening and deepening an old drainage ditch, and sloping the banks to stop cave-ins.

This ditch was 2.06 miles long, and the depth varied from 5½ ft. to 15 ft. It was 42 ft. to 62 ft. wide at the top and 20 ft. wide at the bottom. The Erie Dragline cleaned up the job in 72 working days, excavating 16,000 cu. yds. of material.

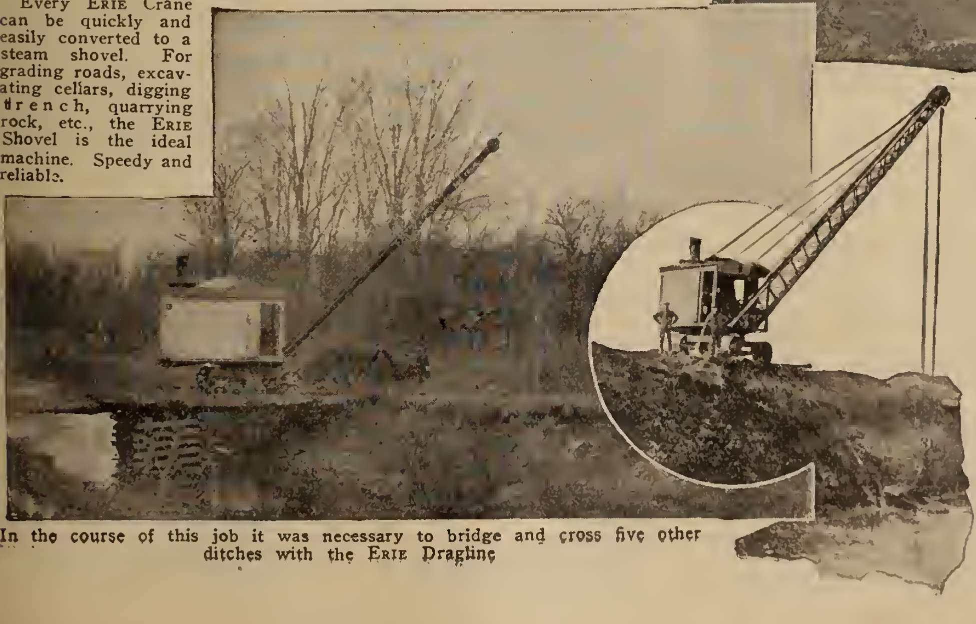
We will be glad to send you full information about the Erie Dragline—working ranges and other data Write for Bulletin C-30.

ERIE STEAM SHOVEL CO., Erie, Pa., U.S.A.

Incorporated 1883. Formerly Ball Engine Co.

Builders of Erie Steam Shovels; Locomotive Cranes, Railway Ditchers

Every Erie Crane can be quickly and easily converted to a steam shovel. For grading roads, excavating cellars, digging trench, quarrying rock, etc., the Erie Shovel is the ideal machine. Speedy and reliable.



In the course of this job it was necessary to bridge and cross five other ditches with the Erie Dragline

Trimming the slope after it has been roughly cut to approximate depth and width.

Photo at left. Starting to cut. Photo above: Swinging back to cut, after dumping.

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Canadian Steel & Wire Co.
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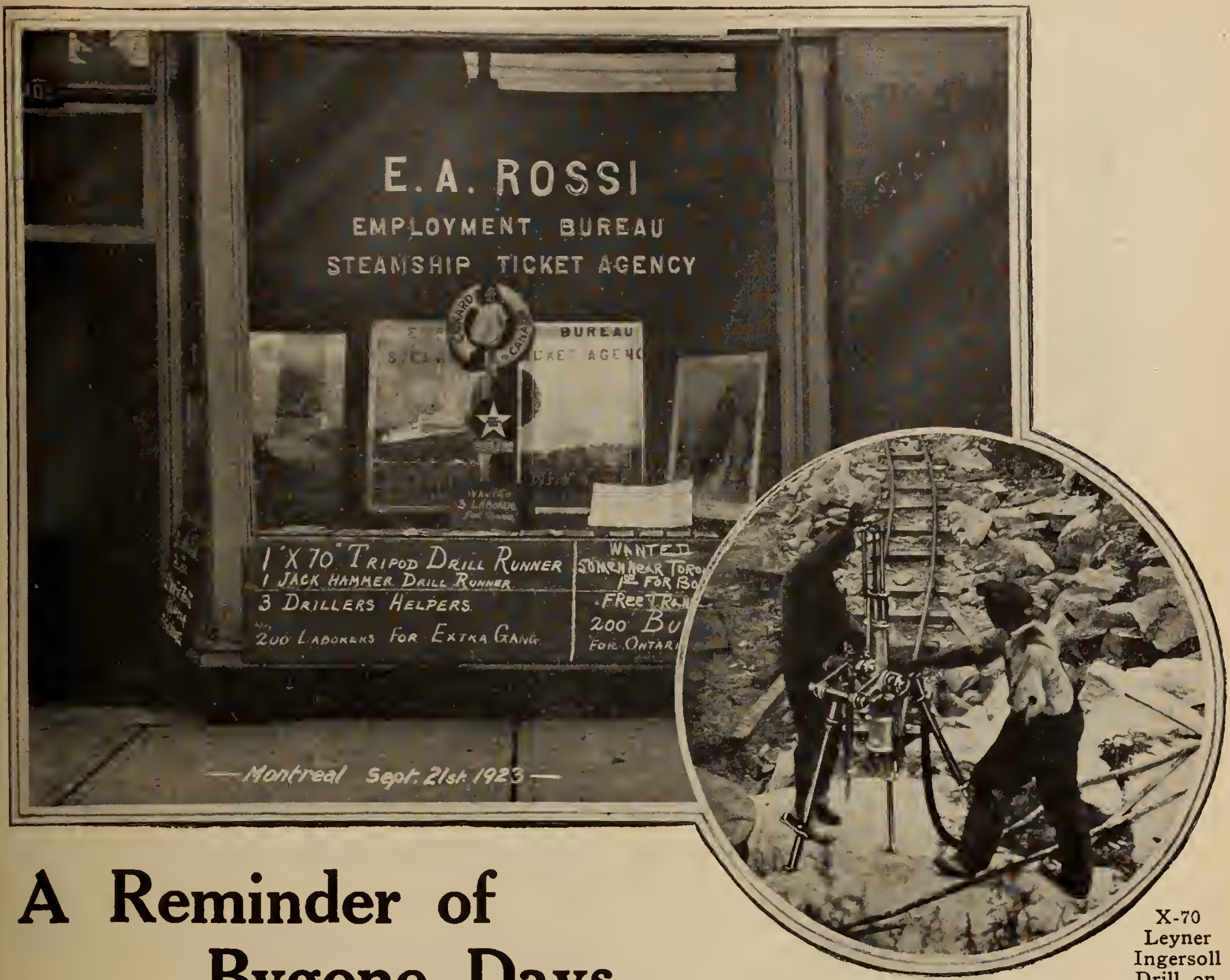
Greening Wire Co., B.
Hopkins, & Co. Ltd., F. H.
Mussens Limited
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company

Wood Preservations
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Woodworking Mach'y (Combination
Canadian Blower & Forge Co.



X-70
Leyner
Ingersoll
Drill on
Tripod

A Reminder of Bygone Days—

The sign in this photo of a Montreal Employment Agency indicates the ever increasing popularity of the modern Hammer Drill such as the types mentioned.

To Canadian mining men and contractors it will no doubt recall many a large mining or construction project of a decade or two ago when advertisements for Rand "Little Giant" Drill runners were a common sight in employment office windows.

In Canada, as in most other countries, the old slow striking piston Drill has given way to the rapid cutting hammer type on practically all classes of work except when steam is used.

Since the inception of machine drilling the advent of each new type of Ingersoll-Rand Drill has brought about such improvements in the art of rock drilling as higher drilling speed, lower cost per foot of hole drilled, and greater ease and convenience of operation.

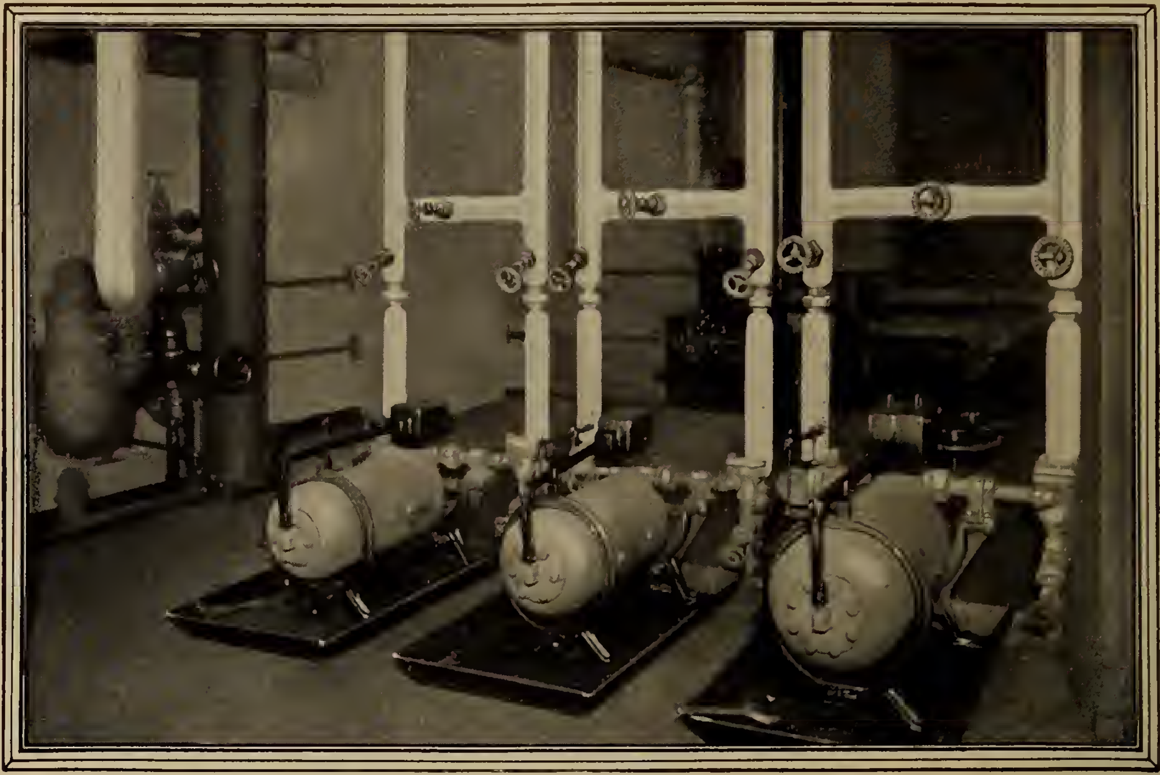
Write for bulletins

Canadian Ingersoll-Rand Company, Limited

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

For the U. S. refer Ingersoll-Rand Co., 11 Broadway, New York.

Ingersoll-Rand



CRANETILT NON-RETURN TRAPS USED TO DRAIN THE STEAM MAINS IN A LARGE POWER PLANT

CRANETILT STEAM TRAPS SAVE COAL

Boiler room economy largely depends upon efficient feed-water heating. Cranetilt Direct-Return Traps accomplish this economy by returning water to the boiler at a higher temperature than any other device. Cranetilt Non-Return Traps will handle ten times more water than bucket, pot or float traps with equal pipe-size connections. Cranetilt Three-Valve Lifting Traps are especially adapted for use on return lines handling condensation where the pressure will vary from a vacuum to the highest working pressure.

CRANE

CRANE LIMITED, GENERAL OFFICES: 386 BEAVER HALL SQUARE, MONTREAL
CRANE-BENNETT, LTD., HEAD OFFICE: 45-51 LEMAN STREET, LONDON, ENG.

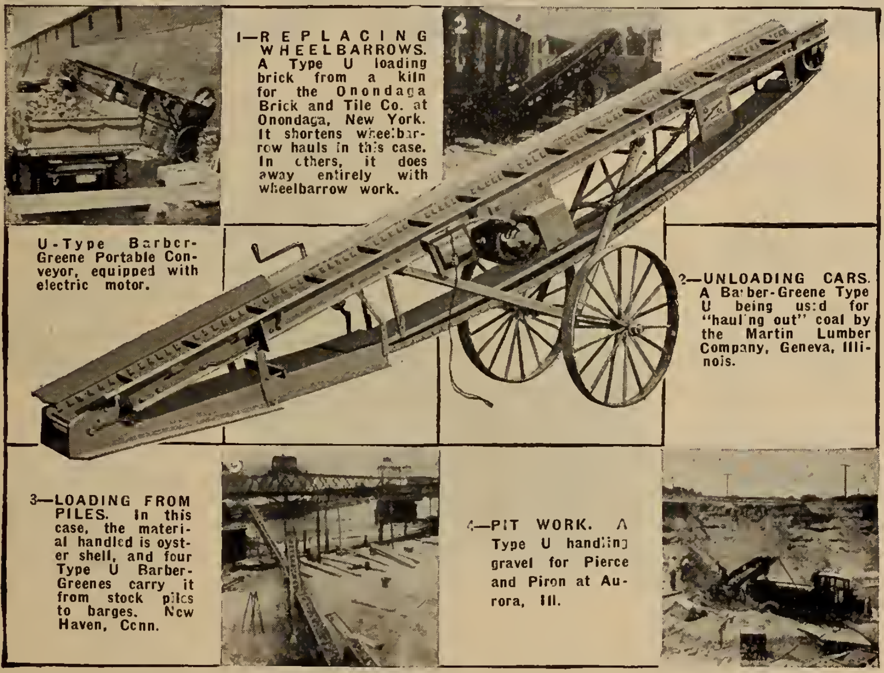
Branches and Sales Offices in 21 Cities in Canada and British Isles
Works: Montreal, Canada, and Ipswich, England

Crane "Telsa" Wash Sink Faucet

MUSSENS M LIMITED

BARBER-GREENE

Portable Belt Conveyors — Self Feeding Bucket Loaders



1—REPLACING WHEELBARROWS. A Type U loading brick from a kiln for the Onondaga Brick and Tile Co. at Onondaga, New York. It shortens wheelbarrow hauls in this case. In others, it does away entirely with wheelbarrow work.

U-Type Barber-Greene Portable Conveyor, equipped with electric motor.

2—UNLOADING CARS. A Barber-Greene Type U being used for "hauling out" coal by the Martin Lumber Company, Geneva, Illinois.

3—LOADING FROM PILES. In this case, the material handled is oyster shell, and four Type U Barber-Greenes carry it from stock piles to barges. New Haven, Conn.

4—PIT WORK. A Type U handling gravel for Pierce and Piron at Aurora, Ill.

Reduced to $485.

U-Type Portable Conveyors—Unusually Useful

This conveyor is our one-man machine for universal use. It is 22 feet long, has a 12-inch belt of special patented construction with steel flights, every 18 inches, which enables it to handle material at exceptionally steep angles. Skirt boards run the full lengt hof the belt, are 6 inches deep, and enable the conveyor to handle large lumps.

There is a crank operating a self-locking worm winch, for elevating the discharge end to any height desired, up to an angle of 35 degrees.

This conveyor generally displaces from two to ten men, depending on the nature of the work. As a rule, it handles about 26 tons of coke per hour, 44 tons of coal, and 90 tons of gravel. The amount per hour depends on the nature of the material and on the conditions of loading.

The type U has proven so popular in every state of this country and in foreign countries that our volume this year has enabled us to cut our production costs considerably. Making this conveyor in a single width and length permits us to offer high quality at a low price. We have, therefore, reduced the base price (for the conveyor without power) to $485 a reduction of $200.

With a 3-phase, 60-cycle, 220-volt motor, the price is $625. Other motors are supplied on our usual price list for special motors. With Fuller and Johnson gas engine the conveyor is furnished for $670. All prices f.o.b. Aurora, including Duty and Exchange.

Send for detailed description and catalog.

Canadian Sales Agents:

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

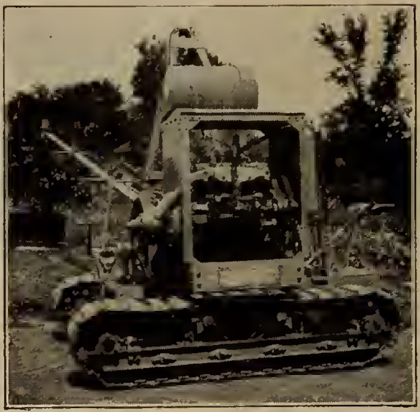
PARSONS

Model 15

Boom—30 feet.

Power Plant—4 cyl. Gas engine.

Traction—Half Parco.



Model 20

Boom—30 feet.

Power Plant—20 H. P. 4 cyl. Gas engine.

Traction—Full length Parco.

There isn't a backfiller on the market—there isn't a construction gang in America and there isn't a span of mules in Missouri that can handle your backfilling in the same time and for the same amount of money as you can handle it with a Parsons.

That's the sort of a machine you want and that's the machine we build. The Parsons Backfiller is the most powerful, compact, mobile and dependable piece of machinery on the job.

The J. P. White Company called their Model 20 the best labor saver in their organization and the Western Construction Company said they believed their Model 20 was the best item in their equipment and the best in the market both in durability, speed and cost of operation.

If you could see one in operation you'd be satisfied and so would we for you'd pick a Parsons and stop picking.

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Just the same as the big Smiths

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The satisfactory service they furnish is typically Jenkins. Their design, the materials used in their construction and the way they are constructed guarantee that.

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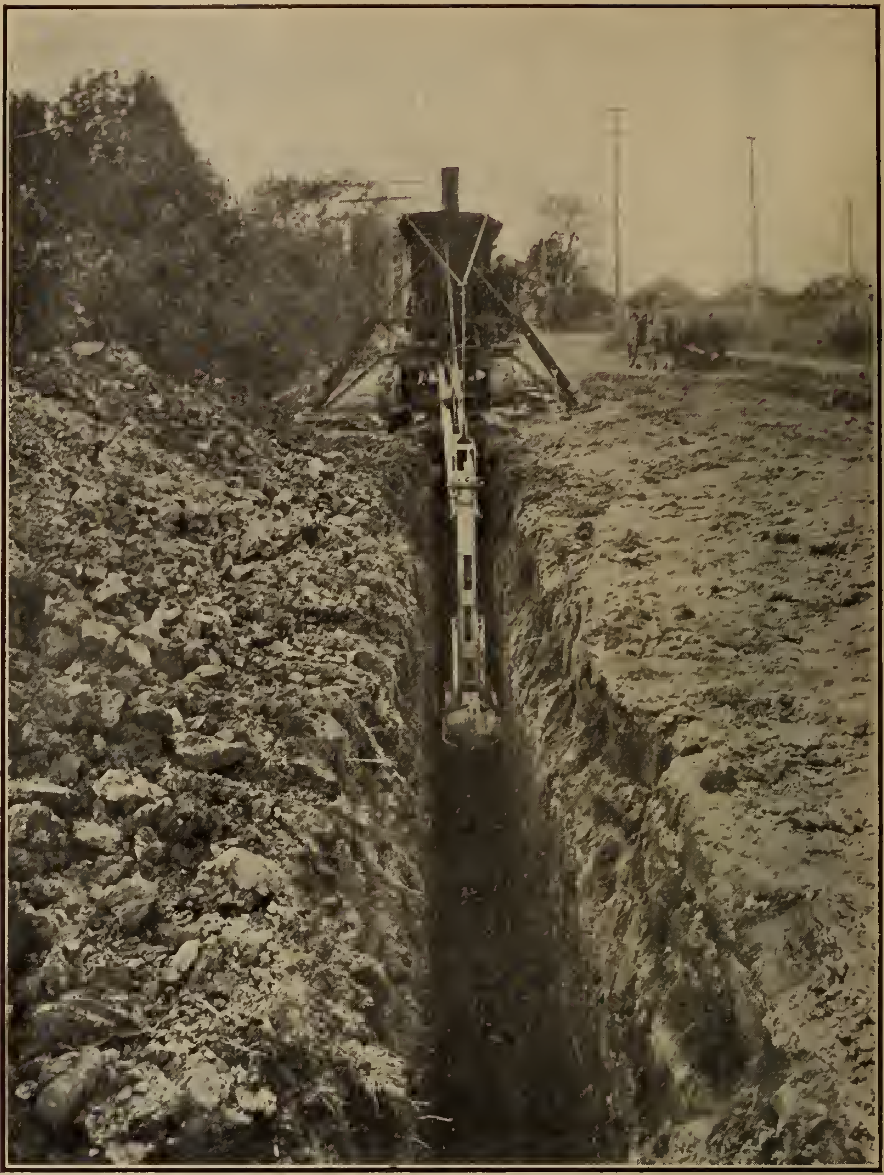
There are two important fields in which the Keystone Excavator will make more money for the Canadian Contractor than any other equipment he can buy.

The first is the road grading or shallow excavation field in which the Keystone is used with a forward thrusting ⅝-yard Skimmer Scoop—cleaning up 300 to 500 cubic yards per day.

And the second is the ditch digging and excavation digging field where the Keystone is used with an auxiliary boom and Ditcher Scoop which works towards the machine and digs out 250 to 400 cubic yards per day.

The illustration shows a typical Keystone ditching job. Here the trench was sunk to a depth of 16', in places working in hard blue clay and taking out the material in a clean-cut manner, doing away with any need of hand trimming.



KEYSTONE Model 4'23 EXCAVATOR

With a machine that will do the widely different work described above and a crew of only 3 men, the contractor can handle 95% of the excavation work offered in Canada.

The Keystone has ample "punch," being equipped with a modern 32 h. p. steam engine, to handle the work. It travels under its own power and its weight—12 tons—is such that it puts no undue strain on streets and bridges. The Skimmer Scoop, Ditcher Scoop, Dipper Scoop and Clamshell Bucket are sold independently, as required. The Keystone is built entirely in Canada by a firm with over 35 years of experience and is very moderately priced. Deliveries can be made immediately from stock.

THE WORK OF 10,000

With a clatter and a roar the Keystone dug its relentless scoop into the bank, picked up about a carload of earth and dumped it into a waiting truck.

"That's just it," sneered a tired looking man, who was standing by, "It makes me wild to see a piece of machinery taking the bread out of honest men's mouths."

"Don't quite see how you make that out!" remarked the foreman in charge of the gang.

"Well, isn't that machine doing the work quicker than a hundred men with picks and shovels could do it?"

"That's so," agreed the foreman, "and, according to that argument, would'nt it be better still to employ 10,000 men with toothpicks and saltspoons?"

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Buckets in all types and sizes for all purposes—kept in stock

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At very low cost per capita, any community, regardless of size, can have a modern waterworks system which will assure an unfailing supply of clean, pure water at all times. The ideal system should include a Canadian Des Moines Elevated Steel Tank for water storage, together with filters, pumphouse, mains, hydrants, etc. We will assist the community officials in planning the system and are prepared to take complete charge of the work of installation.

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Public Health is Vital — Delay is Dangerous

Write our nearest office to-day for full details.

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Limited

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MONTREAL, QUE.

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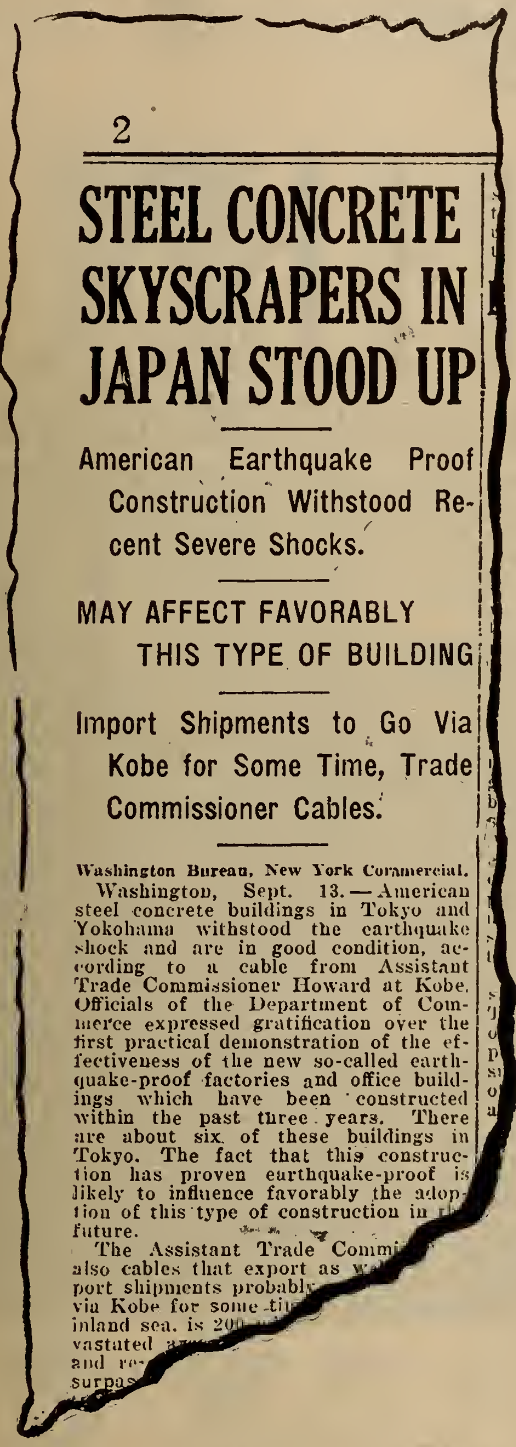

2

STEEL CONCRETE SKYSCRAPERS IN JAPAN STOOD UP

American Earthquake Proof Construction Withstood Recent Severe Shocks.

MAY AFFECT FAVORABLY THIS TYPE OF BUILDING

Import Shipments to Go Via Kobe for Some Time, Trade Commissioner Cables.

Washington Bureau, New York Commercial.

Washington, Sept. 13.—American steel concrete buildings in Tokyo and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner Howard at Kobe. Officials of the Department of Commerce expressed gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokyo. The fact that this construction has proven earthquake-proof is likely to influence favorably the adoption of this type of construction in future.

The Assistant Trade Commi
also cables that export as w
port shipments probabl
via Kobe for some ti
inland sea, is 20
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CONCRETE Proves its Permanence

Concrete adopted in Japan as an earthquake-proof building material, has met and successfully weathered the severest of all possible tests—the biggest earthquake of modern times.

While buildings of less rugged construction and inferior durability crumbled under the repeated shocks or were licked up by the ensuing flames, those of steel and concrete remained unscathed. Neither quake nor fire could hurt them.

They stand to-day, in a sea of ruin, monuments to the indestructibility of Concrete construction, justifying the foresight of the men who built them.

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CANADA CEMENT
Uniformly Reliable

CANADA CEMENT
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FOR PERMANENCE

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Canada Cement Company Limited

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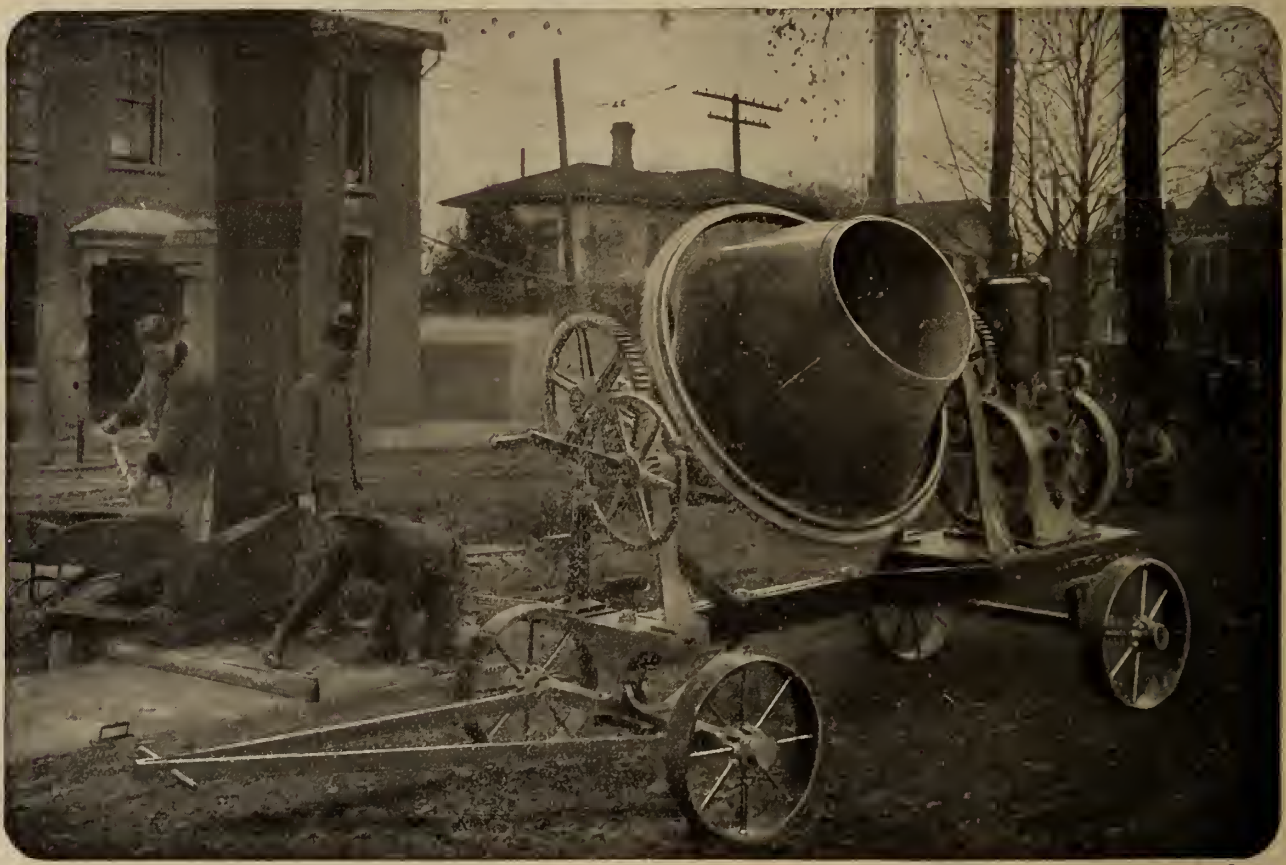
"MOVES THE EARTH–MIXES THE CONCRETE"
TRADE MARK

The CUB-HEX

A LIGHT-TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX."

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

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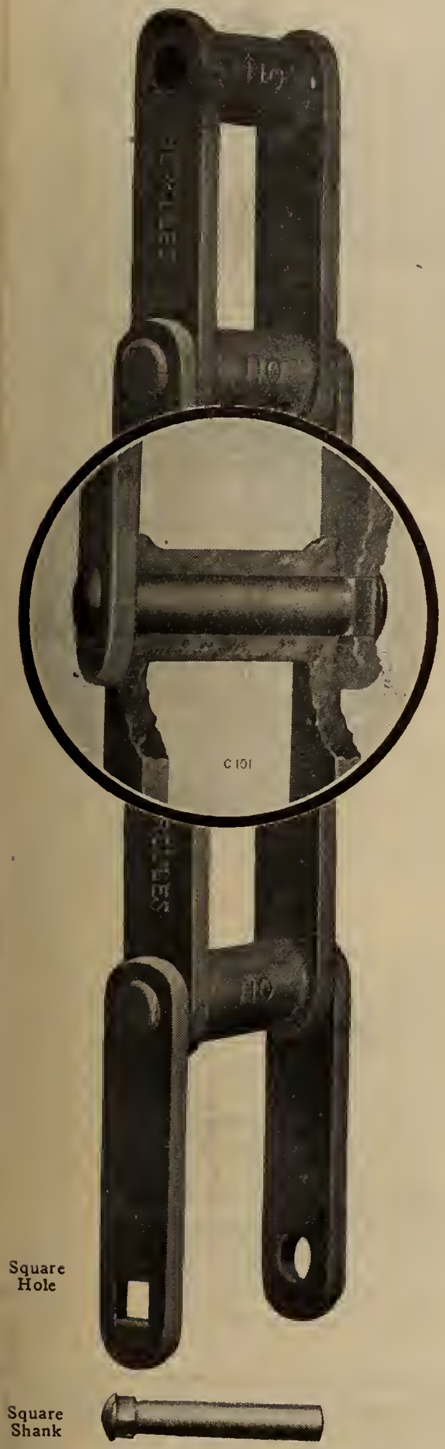
For Rough, Heavy Service Use Jeffrey "Hercules" Chain



JEFFREY Square Shank Pin Hercules Combination Malleable Iron and Steel Chain is designed for rough heavy service in elevators or conveyors handling coal, stone, sand, gravel, etc.

Economical in First Cost. Being a combination of both malleable block links and steel side bars with steel pins, the "Hercules" Chain is the first step to all steel types of chain and therefore makes a very economical chain, in consideration of not only its wearing qualities but especially of its ability to withstand shock.

It is used for drives of moderate speed. In elevator service it is usually attached to buckets in single or double strand, and in conveyors of single or multiple strands with and without pusher attachments.

The square shank pins confine the wear to inside of solid links, practically no wear to outside links. The pin is held rigidly in the Side Bars, thus distributing the wear to the long wearing surfaces of the solid links.

Jeffrey Labor Saving Equipment includes a complete line of Elevators; Chains; Sprockets; Conveyors of various types; Portable Loaders and Unloaders; Portable Belt Conveyors; Coal and Ashes Handling Machinery; Skip Hoists; Crushers; Pulverizers; Shredders; Coal Mining and Tipple Machinery; Ventilation Fans, etc.

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MATERIAL HANDLING MACHINERY

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Plymouth Locomotives Used Year 'Round

When the first of November rolls around, construction work begins to slow up and comes to a stop. Equipment is laid away, and an efficient working organization disbanded. Seven months' profits must take care of the remaining five.

Not so with Cunningham Construction Co. Industrial haulage enables them to earn dividends on their equipment twelve months out of the year, which would be impossible with truck or team haulage.

Please read the letter in adjoining panel—then write us about YOUR haulage problem and we will send you interesting literature.

THE FATE-ROOT-HEATH CO. Plymouth, Ohio

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CUNNINGHAM CONSTRUCTION CO.,
Indianapolis

The Fate-Root-Heath Co.,
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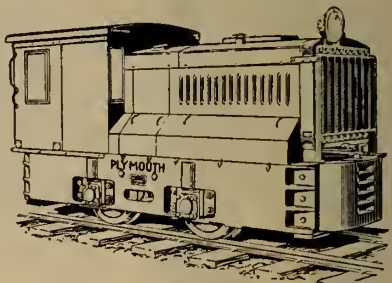
Gentlemen—Our three Plymouth Locomotives have been in almost continual use since we purchased them in 1920.

During the road building season they are used for hauling batch cars to mixer, and for the past two winters, for grade work in connection with our steam shovel.

These locomotives have been very satisfactory in every respect.

Yours truly,
CUNNINGHAM CONSTRUCTION CO.,
(Signed) By Jas. T. Cunningham.



Plymouth 7 ton 4 speed, Gear Drive

PLYMOUTH
Gasoline Locomotives

PUDLO

BRAND
CEMENT WATER-PROOFING POWDER

Water Can't Penetrate Your Concrete

If You Use PUDLO POWDER

"Trifles make perfection." The truth of this old adage was never better demonstrated than in the case of PUDLO. Although it may seem only a small item, it often means the difference between success and failure. For prices and full particulars, write--

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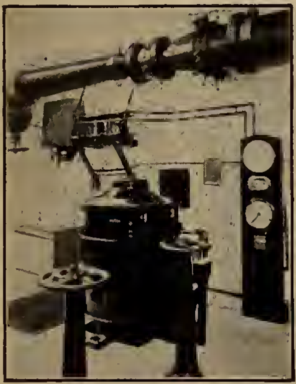

Venturi Sewage Meter Installation
San Francisco, Cal.

Sewage Pumps

Require Constant Checking

The pumping of sewage is a much more severe service than is the pumping of clear water. The difference between theoretical and actual discharge of a sewage pump may reach an unsuspected total unless knowledge of the pump performance is constantly available The falling-off of efficiency may be the result of a gradual wear of valves, impeller vanes or other moving parts. On the other hand some foreign object or debris may become lodged in the pump, causing an immediate decrease in efficiency with no outward manifestation. This is especially true of centrifugal pumps.

THE VENTURI METER is the only type of meter which can be successfully applied to sewage measurement. Venturi Meters ranging in size from 10 inches to 96 inches are being used for this difficult service with conspicuous success. Charges for sewage disposal are made from the Venturi readings. Plans for future extensions are made intelligently by noting the daily peaks and yearly increases as revealed by the Venturi records. Is not this a subject of interest to your municipal government?

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NEW YORK, CHICAGO, PHILADELPHIA, PITTSBURGH, ATLANTA, DALLAS,
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built from
Our Concrete

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Write us for Catalogue and Prices

Dominion Concrete Co. Limited
KEMPTVILLE - ONTARIO

Two 15,000 gal. Rivetted Tanks and one Three compartment truck tank supplied by us to The Pure Oil Co., Brantford

TANKS

For over thirty years we have been specializing in the fabricating of tanks (either welded or rivetted) and steel plate work of all kinds.

The accompanying illustration shows two of the many different styles of tanks we are manufacturing.

Our method of welding steel storage tanks is an absolute guarantee against leaking or breaking.

We build

Tanks (welded or rivetted), Steel Pipe, Elevators, Conveyors of all kinds, Steel Stacks, Steel Buckets, Dumping Skips, Screens, etc.

THE WATEROUS ENGINE WORKS CO. LTD., BRANTFORD, CAN.

ESTABLISHED 1886

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Fall Construction is Active

During October, construction contracts awarded in Canada, according to McLean Building Reports, Limited, amounted to $30,078,100, compared with $23,382,100 in September, and $24,270,300, in October, 1922. Residential buildings accounted for 28.1% of the October total, and amounted to $8,434,600. Business buildings amounted to $4,345,600, or 14.4%; industrial buildings, $1,329,800, or 4.4%; public work and utilities, $15,968,100, or 53·1%. The value of contemplated new work reported during October was $33,968,000.

In commenting on these figures MacLean Building Reports, Ltd., state: "It is gratifying and reassuring to consider the accomplishments of the year to date as compared with last. The Dominion total for ten months is $277,114,600, while the same period of 1922 was $237,917,500. This is an increase of 16.5%. The increase is contributed by all forms of construction with the exception of residential buildings, although the decrease here is but 5.5%, and represents a drop of $4,958,100. This drop from a monetary viewpoint is negligible, but an analysis of the figures reveals a social problem that demands a speedy solution.

"The number of houses erected to date this year is 15,988, as compared with 18,083 for the same period in 1922, a drop of 11.6%. In view of the fact that the drop in cost is but 5.5%, and that material prices have remained approximately stationary, here is incontrovertible evidence that the building of workers' homes has fallen off, while that is the type most needed to relieve the housing shortage. The non-union worker cannot make the initial payment on a home costing $4,500 or over, and if he can, he is unable to carry the burden of interest, taxes and principal payments without sub-letting. This condition defeats the principle of home owning. If wages cannot be increased then the structural problem of erecting houses or flats which can be sold or rented at decidedly lower prices than those existing to-day cries out for solution."

Photographs Help to Sell Construction Service

Photographs of construction projects can be of great help to a contractor in selling his services if he goes about the matter in the right way. Some of the larger construction firms take advantage of the assistance which pictures can render but unfortunately, the majority of contractors—especially the smaller ones—fail to realize the desirability of taking pictures, if even for their own records. Such contractors will perhaps be interested in the experience of one large firm—Dwight P. Robinson & Co., of Montreal, New York and other large centres—who have found photographs useful in getting business. They explain their system thus:

Progress photographs, as used and developed in our work, form a part of the mechanism for reporting and recording construction progress. In fact, they are so much a part of the daily routine that we are surprised to find that the layman frequently considers their use as somewhat of an innovation.

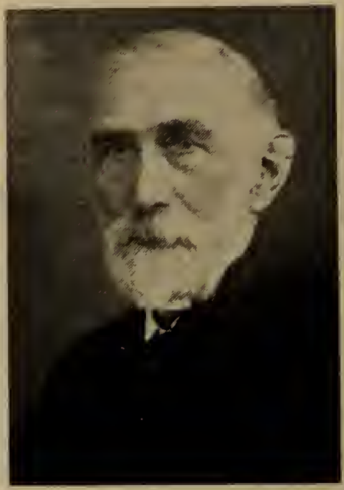
These photographs have three main purposes: first, reporting the progress of the work to the client; second, providing a permanent record of the status of the work at given dates, and third, assisting the executives in the New York office in controlling the progress of the work. Incidentally, progress photographs have been found useful in giving prospective clients a graphic view of our activities. This last use is, of course, not considered in taking routine progress photographs, but their value for this purpose has been so well demonstrated that some suggestions regarding the use of photographs in selling may not be amiss.

Our salesman faces a peculiar task in that the commodity which he sells—service—cannot be made

No. 106

Canada's Engineers—John Langlois

John Langlois was born at Quebec City in 1841. He received his first education at Quebec and later at Ste. Anne de la Pocatiere. Upon leaving school Mr. Langlois engaged in engineering and architectural work at Quebec until 1867 when he moved to Chicago and Memphis, where during the following two years he devoted his time entirely to architecture. In 1869 he moved back to his native city and was given charge by the Quebec Government, of exterior timber explorations along the Marguerite river, north of Seven Islands bay on the north Coast of the St. Lawrence.. During the years following Mr. Langlois was engaged on the location and construction of the Intercolonial Railway and was afterwards appointed assistant on the official survey of the counties of L'Islet, Montmagny and Bellechasse, there doing the service required in order to qualify himself to pass his examination for land surveyor which he successfully accomplished in 1877. From 1877 to 1890 he was successively engaged in the survey of numerous townships in the Lake St. John region, and Gaspe county. He also acted as district engineer for the Dominion Department of Public Works on the lower St. Lawrence, and designed and supervised the building of several boats for the Price Brothers Lumber Co. In 1891 Mr. Langlois, jointly with another surveyor, was entrusted by the British Government with the survey of a number of British Possessions in the Bahama Islands, which work lasted nearly one year.



Mr. John Langlois

From 1892 he was attached to the staff of the Land Patents Branch of the Department of the Interior at Ottawa, until Jan. 1923, when he retired to private life.

visible like material or equipment. His appeal is wholly to the reason—and expressive photographs help to give a quick impression and strengthen a sound argument. The photograph enables him to deliver his message through two senses instead of one.

For selling purposes we need mostly, of course,

(Continued on page 1071)

The Week's Developments in a Nutshell

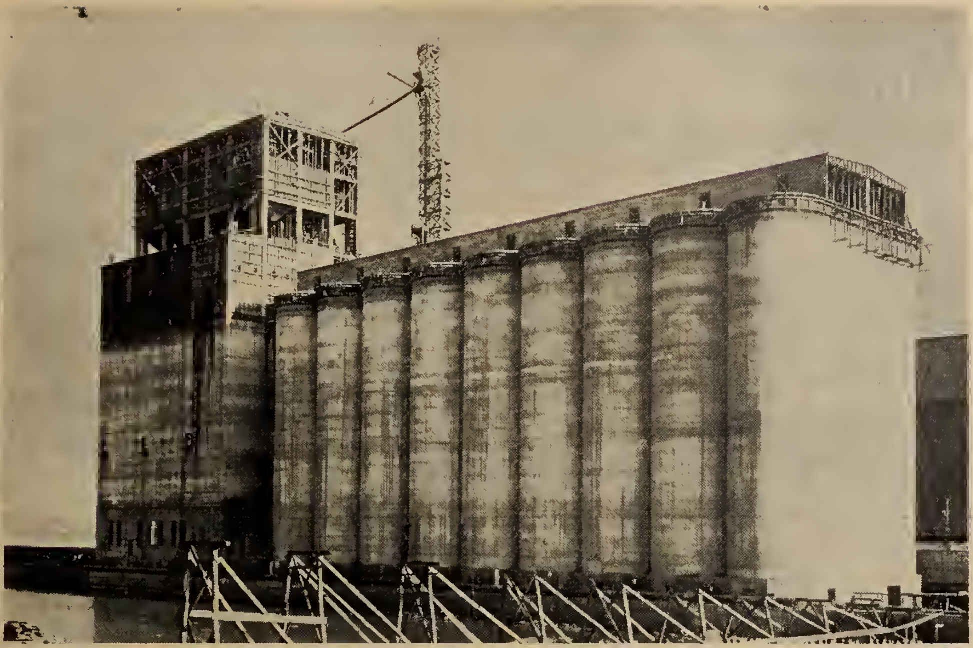
The National Bank of Commerce, New York, says, "It is somewhat popular just now to be pessimistic. The unfavorable is stressed and the favorable is over-looked. There is no denying that in some spots business is poor, and in others bad, but it also is true that, regarded as a whole, business is in fair volume and the outlook is for better business, not worse."

This is a United States' view, but it checks up with that expressed to Contract Record by a prominent Canadian manufacturer. He offered the opinion that, Canadians were getting pessimistic "after the event." In his business, "1921 was very profitable; 1922 not so good; 1923 very slow; but" he adds, "there is no doubt in my mind that we are on the up grade again. It would be foolish to get pessimistic now, when the worst is over."

The steel industry is generally taken as a fair index of conditions. Especially U.S. steel activities are always carefully watched. It came as a great surprise, even to those closest to the situation, when this week a bonus dividend was declared by this company. In Canada our steel companies have also apparently more than held their own through a most difficult year.

The announcement by the Ford Motor Company of a further expenditure of ten million dollars in Canada, and of the Dominion Alloy Steel Corporation that they will commence operations at once on their three million dollar plant, is a good start for 1924 for the building and construction industry.

A slight shading is noted here and there in prices. Steel billets which have been constant since June 1, have given way one dollar. The wholesale index receded slightly during October and lumber is easier in spots; oak flooring and fir timbers are both quoted five dollars down.



Elevator built at Port Arthur, Ont., for James Stewart of Winnipeg. A similar one was also erected for the N. Bawlf Grain Co.

Grain Elevators Built in Record Time

Two 1,250,000 Bu. Units Opened for Commercial Business on October 10, Although First Concrete was Poured Only on May 22—Constructed of Reinforced Concrete

Two new elevators, which represent the last word in elevator construction, have just been added to the water front at Port Arthur, Ont., one of them being owned by the N. Bawlf Grain Company, Winnipeg, and the other by Mr. James Stewart, Winnipeg.

They are practically identical in every detail and are located side by side. Both have a capacity for unloading and cleaning a maximum of 125 cars a day, and ample facilities are available for shipping both by boat and rail. Each elevator has a storage capacity of 1,250,000 bushels of grain.

They are constructed of reinforced concrete, the foundation being a solid mattress of concrete resting upon piles over the whole area.

On account of the elevators being located on the water front in three to ten feet of water, trestles on which the railway tracks were to be laid to switch cars into the elevators were built before starting operations, and the concrete mixing plants, cement storage sheds, etc., were located on this trestle.

The cement was brought in by cars on tracks into the cement sheds. The gravel was dredged from Lake Superior, transported by barge, and unloaded into a hopper and from there conveyed to the storage piles and the concrete mixers by belt conveyors.

The construction of these two elevators constitutes a record for speed in elevator construction at the head of the Lakes; the first concrete was poured on May 22nd, the first grain was taken in on September 30th, and both elevators were operating commercially on October 10th.

The machinery and equipment is of the very best and is capable of handling a great volume of grain at a minimum cost.

The motors were furnished by the Canadian Westinghouse Company, Limited; the sub-station equipment by the Canadian General Electric Company, Limited; the belting by the Dunlop Tire and Rubber Goods Company, Limited; the car hauls and other machinery and castings were furnished by the Dodge Manufacturing Company of Canada, Limited; the scales by the Canadian Fairbanks-Morse Company, Limited, and the spouting by the Western Steel Products, Limited. The splendid co-operation of these companies and all the others furnishing machinery, labor and material helped greatly in attaining the results and enabled the general contractors to make the remarkable showing and complete the elevators to handle this year's crops.

The elevators were designed and supervised by C. D. Howe & Company, consulting engineers, Port Arthur, Ont. Carter-Halls-Aldinger Company, Limited, Winnipeg, Man., were the general contractors.

Load Distribution on Rigid Pavements

It has been ascertained from tests carried out in the state of Illinois that the load distribution on rigid pavements in some cases is as great as 17 feet. In other words, a load on a pavement is transmitted to the subgrade over a definite area. That is, a truck moving down the pavement approaches a certain point, the subgrade at this point is subjected to an increasing pressure which reaches a maximum when the truck is directly over the point. A series of trucks travelling on a pavement surface produces a repeated action such as described above.

When Engineers Are in the Witness Box

Justice Riddell Tells Toronto Technical Men How They Should Give "Expert Evidence" in Court Proceedings

The growth of the system of giving evidence in court proceedings and especially the development of "expert" evidence were the basis of an exceptionally illuminating address delivered last Thursday evening by Hon. Justice William Renwick Riddell to a joint gathering of the Toronto section of the Engineering Institute of Canada, American Society of Mechanical Engineers, Canadian Institute of Chemistry and the Society of Chemical Industry. Drawing upon his wide and intimate knowledge of legal and constitutional history, Justice Riddell sketched the development of British civil law, and especially the growth of the jury system with which sprang up more or less well defined regulations as to what constituted suitable evidence.

Speaking of the recognition which the Magna Charta had given to court actions, the justice pointed out that at that time juries had been unknown, and that they had been the development of the 100 years immediately following. He emphasized as curious the fact that the jury, one of the most important features of the development of English court practise, should have its origin shrouded in an obscurity which has so far been impenetrable.

The manner of evidence in these jury trials had simply been that each party to the action would bring his train of partisans, who would swear that they believed the side which they were championing to be in the right. After a succession of these affidavits, and without the presentation of any proper evidence, the jury would render its decision, basing it merely upon its knowledge of local conditions rather than upon any facts which had been uncovered for its consideration.

Gradually the taking of evidence had developed, and a notably forward step had been recorded in Attorney-General Coke's protest in the reign of King James the Second against hearsay evidence. The objections which the Attorney-General had taken had been that the person who gave such evidence could not be prosecuted for perjury and that such evidence was not proper as the basis of a positive finding, which the jury was bound to deliver. Finally, therefore, it had come to be recognized that the only permissable evidence was that based upon personal experience or observation.

His Lordship then spoke of expert evidence as the exception to this general rule, and as the only opinionative testimony which was now proper in a court of law.

For a long time experts were employed in trials as sort of assistants to the judge, and their communicated knowledge was withheld from the jury. This, he said, was the old practice. But, though the development of the situation is somewhat obscure, it is certain, he stated, that by 1700 the present practice came into force whereby experts are allowed to give their "opinions." His Honor described expert evidence as professional—acquired by scientific training, accumulated knowledge in the matter to which the particular evidence in question pertains. But to attain their privilege of opinion, expert witnesses must first establish qualification to be regarded by the court as a proper expert, while, on the other hand, the lay witness is never first doubted.

In closing his address, interspersed with many humorous remarks, Judge Riddell gave to the gathering of engineers a code of approved conduct in the witness box. He held that it should be honest, that it should only be given by a person eminently qualified, and that it should be given in such a manner of clarity that it would impress its message of truth upon the minds of the jurors.

Gas and Fertilizer to be Made from Halifax Refuse

New Reclamation Plant will be Built—Gas will be Used for Developing Power

The town of Halifax proposes to reclaim all its refuse and has applied to the Ministry of Health for permission to borrow money for constructing a plant. At present the refuse, amounting to about 22,000 tons annually, is placed on dumps. From information furnished by W. H. Sagar, the cleansing superintendent, to "Municipal Engineering" of London, we obtain the following information concerning the plant:

Halifax has a population of just over 100,000. The city is by no means thoroughly sewered, as there are still 16,000 pail closets in use, and it is proposed to utilize the contents in producing fertilizer in connection with screenings from the refuse.

There will be a screen 18 feet long by 5 feet in diameter, the first 12 feet containing ¼-inch or 5/16-inch wire mesh and the remaining 6 feet, 1½-inch mesh. To allow for a variation of moisture in the refuse, so that damp material can be given a longer screening than that which is dry, the screen is designed with a tilting arrangement allowing it to assume any angle with the horizontal up to 12 degrees, the angle being variable while the screen is in motion. The dust coming through the fine mesh will fall into a small hopper and will be carried about 100 feet by means of a pneumatic suction plant operated by a 15-horsepower motor which will draw the dust through a 4-inch pipe and deposit it in a hopper immediately over a pug mill in which it will be mixed with the contents of the pail closets. The pail material will be deposited in a sealed concrete tank, from which it will be drawn by a centrifugal pump and lifted into the pug mill where it will be mixed with the dust from the screen. This pug mill is a U-shape trough about 6 feet long with two parallel shafts, each carrying small knives which revolve in opposite directions. The mixture falls on to a belt conveyor by which it is carried direct to a railway car for transportation.

Production of Gas

Probably the most novel feature of the proposed plant is the vegetable gas producer by which it is proposed to make gas from the refuse. Mr. Sagar says that if the working plant produces 75% the efficiency of the test plant, it will be successful. From tests made by charging the producer with a light combustible matter such as paper, rags, carpet, oilcloth, banana stalks, straw and general market refuse, 47,000 cubic feet of gas was produced per ton of refuse with an average calorific value of 130 b.t.u. per cubic foot. After passing the gas through a cascade scrubber, extracting the tar, and then through a dry scrubber in a manner similar to that employed for coal gas, the gas is passed to a double mixing box in front of a boiler which stands on three cast iron cradles and requires no brickwork. The boiler is 21 feet long by 5 feet 6 inches diameter and contains 172 tubes which run the full length of the boiler and give a heating surface of 1,500 square feet. Opposite each tube and about 3 or 4 inches from it is a burner, from which the flame passes into the tube and is drawn through it by an induction fan placed at the chimney end of the boiler. The combustion is so complete that only a 30-foot steel chimney 10 inches in diameter is required to carry away the fumes. The evaporation test has shown 3 pounds of water per pound of fuel from and at 212 degrees. The boiler is capable of producing 8,250 pounds of steam per hour. The steam will be used to drive a 225-horsepower vertical compound engine with a direct coupled alternator, which will produce power for driving the salvage plant and the fish plant, with a surplus for lighting the premises and other purposes. The residue from the consumption of the refuse will consist of a white ash containing a good percentage of potash which will be mixed with the dust for enriching the fertilizer.

How Can the Wheels be Kept Turning?

Neglect of Small and Comparatively Insignificant Troubles Leads to Serious Interruption of Plant Operation—Distributors' Service Departments Are not Sufficiently Depended Upon

No one likes to have his faults glaringly brought out to public view, and yet it is only by airing these subjects that betterments can be effected. "Keeping the Wheels Turning" means—fundamentally—system, order, judgment and initiative in stopping the breaks before they happen.

The elimination by the contractor of the many small and incidental delays and breakages will have a very direct bearing on the smooth-running operations of his organization, the ultimate profits from the work involved, and the saving of tremendous depreciation bills.

The contractor is naturally directly responsible for placing men of the proper knowledge and experience in charge of plant equipment and being absolutely certain that the machinery and equipment used shall receive the same care and attention as should other vital elements of the construction work itself, because upon the uninterrupted service of his plant equipment depend the continuity and proper completion of his contract.

Many large and well-organized contractors maintain efficient service departments in which they dutifully and regularly overhaul, test and care for equipment, placing it after each job in position to go on the next with assurance of its being mechanically sound. Such concerns, however, are in the minority, while, on the other hand, the smaller contractor is faced with an individual problem of personally supervising, inspecting and choosing his men with more care, as has to be done in any small organization. The small contractor's problem, as a consequence, is one that he should study with a realization that he has a difficult question to solve and must devise ways and means of meeting it accordingly. One of these means and the most obvious is—learn to rely on the distributor's organization for equipment, service and help. Neither the large nor the small contractor who persists in the practice of engaging incompetent mechanics, attempting to operate a high-grade piece of machinery with a $4 a day laborer taken off a sand dump, can expect anything but grief from the results. You cannot expect from such a type of intelligence the proper interest, nor the possibility of any such man's mastering the intricate details of operating efficiently a fine piece of machinery and keeping it in perfect running order. The daily disastrous results of such practises are an open book to the distributor and contribute more toward dissatisfaction, trouble and ill feeling toward the distributor than any other single cause. As a direct result of this and other practises, the contractor is, without the slightest provocation or justice, led to condemn the plant, to condemn the manufacturer, and to condemn the distributor who sold it. We urge every contractor to search for and engage intelligent men with proper mechanical knowledge, as this will go a long way toward preventing annoying and expensive breakdowns.

Losses from Cheap Labor

Many contractors claim they cannot hire such men. Admitting that it is difficult, I will quote from a recent experience in which we sold a plant costing $11,000 and urged the contractor at the time of purchase to look for a competent operator. He asked us also to keep our "eyes open." We found one (an expert) who demanded $1 an hour. We placed this man in contact with the purchaser of the equipment. The purchaser stated that the price was too high. He would not engage him. Result: He took a $5 a day laborer that he thought intelligent enough and broke him in. Two weeks later one of the most important main bearings on the machine burned out. The boom was dropped and badly distorted. Three other important breakdowns resulted, all directly traceable to this cause. The contractor is now searching for a competent man, realizing that the advice first given him was sound and sincere. This contractor spent ten times more money on repairs than he would have spent in maintaining a good operator. Stop the leaks—this is one of them.

It calls to mind the old story of Peter, the little Dutch boy hero who, rambling along the dikes of Holland one day, discovered a small leak through which water was trickling. Realizing the vital importance of not having this leak develop into a larger one, he thrust his arm into the hole, stopping it, and remained there for two days without food until the leak was finally repaired. This little boy was heralded as the hero of Holland.

Every big accident has a small beginning. It is the slipping clutch; the loose bolt; the broken pin;

the slapping bearing; the piston knock; the loose chain; the wearing gears, and hundreds of other causes that are not corrected in time.

A Striking Illustration

The writer was going over a large road job a few weeks ago and stopped to inspect a paving mixer. The mixer was working smoothly, but on stepping upon the operator's platform I noticed that one of the main counter-shaft bearing bolts had dropped out. I asked the operator why he did not replace it. He claimed that he could not stop and had no one to send down for a machine bolt. He had a piece of bale wire through the bolt hole, twisted taut. I told him the first thing he knew his whole plant would be broken down. He laughed at me and said he guessed not—that it had been running that way for two weeks. I finally left the mixer and continued my inspection trip. Fifteen minutes later when repassing the mixer I found that it had been shut down. Coincident with this, the bale wire giving away, the bearing cap went too, allowing the entire main shaft to become distorted and twisted out of shape. The stoppage paralyzed about nine trucks with compartment bodies, the entire loading and unloading gang, the entire mixer gang and the entire pumping plant for nearly an hour and a half, resulting in the loss of at least $600, but, fortunately for the contractor, the distributor had parts in stock, otherwise the loss would have been greater. It would have cost in the beginning but $1 to send a truck or light car for a bolt.

The importance of lubrication cannot be underestimated. When the machine is new, the contractor usually takes considerable care of it. As soon as it becomes a month or so old, it is the old story of letting it run until it stops. Proper methods of lubrication are as vital as the lubricant used itself. Smearing grease all over a chain on a concrete mixer or any traction drive of a unit is destructively wrong. It collects dirt, cement and sand, making a cutting compound which soon ruins the sprockets and chain. Learn the right kind of lubricant which you should use on chains, and at frequent intervals wash the chain with kerosene and relubricate it with fresh oil.

Take off the stub of the grease cups occasionally throughout your machine and see that the oil passage is not blocked. If you lose an oil or grease cup top get a new one. Do not allow it to go neglected for weeks and weeks, because when one bearing goes its companion bearing also goes.

Use the Distributor's Service Department

Time and again when the service organization maintained by the reliable distributor is in the field or on the job checking over or repairing some piece of equipment, it is traceable and found beyond doubt that had the original instructions, given to the operator when the machine was started, been followed there would have been no cause for the breakdowns or delays. When the distributor is maintaining an expert and well-organized service department exclusively for the contractor, to willingly and gladly give him mechanical advice or assistance when needed, it seems poor economy on the part of the contractor not to take advantage of it.

A good suggestion that a contractor could well follow is to detail some bright, ambitious young man in his organization and send him around through the plants of two or three manufacturers for instruction, so that when he returns he will have increased his mechanical knowledge of equipment. Every factory is glad to co-operate, and the distributor will do likewise. Another point often overlooked is that relatively it does not cost much to properly house machinery when idle and thus prevent rust, damage and theft and afford the opportunity of overhauling, greasing and repainting. This all means lessened depreciation.

In our personal effort to alleviate some of this trouble we interested the largest contractors in our territory and called a special evening meeting of their foremen, superintendents and executives and gave a little lecture with charts. You would be surprised to know that from no one of these organizations did we have a call for a mechanic for over six months.

If in any way you feel that your distributor can help you in these problems, call on him and tell him what you want—make use of him. He is like a bank. If you do not borrow from it, it won't make any money. That is what a bank is for, and a distributor is for the same thing. Borrow from him, and you will find that—unlike the bank—you will not have to pay him back. His experience is free—his nominal service charge you should be glad to pay. Occasionally the factory will play an important part in service work, but as a rule it is far from the job and out of touch with the field end. A manufacturer has his own problems of production and he properly relies on the distributor to represent him intelligently in the field, and it will always be so. For this reason the distributor will always bear the brunt of the trouble and must have the courage and ambition to overcome it and meet the obligation, and the contractor must support him loyally.

In closing, bear in mind that machinery will not take care or renew itself. The human body will build up lost, wasted and worn tissues but no machine can recover or build up lost bearings, broken nuts and worn gears. They must be replaced by the aid of human hands, and these hands should be trained to do this work intelligently and painstakingly. If this is done, right down the line, it will not be difficult to "Keep the Wheels Turning."—By C. H. Clark in "Contractors' and Engineers' Monthly."

Tourist Traffic Totalled $100,000,000 This Year

"From reports received from the different sections of Canada and from railway, steamship and motor travel figures, there is every reason to believe that a conservative estimate of the total value of tourist traffic into Canada for the year under review would be not less than $100,000,000.

"This means it has already become one of Canada's most important sources of wealth. When money is brought into the country by tourist travel it is the same as if goods were exported to that amount and money received in return, the only difference being that nothing has been shipped out of the country that leaves the capital stock diminished.

"There were only in the year under review three items of export trade that aggregated more than $100,000,000, so that the export of scenery occupies fourth place in Canada's foreign trade."

Cleans Buildings with Sand Blast

Woman Enters New Field of Endeavor

With a Portable Compressor, Hose, Nozzles and Sand Catchers, She Renovates the Grimy Facades of Large Structures

By F. A. McLEAN

Soap and water are the cleaning mediums employed by most women in removing dirt about the household. Mrs. E. G. Dobyns, of Cincinnati, Ohio, however, uses compressed air and sand to change the grimy face of things, and instead of floors, walls or ceilings, Mrs. Dobyns attacks the expansive facades of hotels, churches and kindred structures.

Mrs. Dobyns, who hides her identity behind that of the Modern Sand Blast Company, is a housewife, a mother, a bookkeeper in a florist's shop, and a prominent member of the Business Women's Club. Still in the early thirties she has made a career for herself by cleaning the outside of buildings with sand blast. With her mobile plant she has successfully cleaned many kinds of stonework, removed paint from steel structures, renovated terra cotta, tiling, stucco and roofing of various sorts. She is probably the only woman engaged in this kind of work in the world.

Sand-blasting has long been known to manufacturers as a valuable aid in cleaning castings, drop forgings, heat-treated parts, etc., and in the finishing of small tools, buidlers' hardware, glassware, lamp bulbs, etc. The simplicity and low cost of this method of cleaning and finishing led to its application for cleaning brick and stone buildings, bridges, tanks, and other structures. Until quite recently, however, efforts along this line were badly handicapped by the poor design and unwieldly dimensions of the equipment available.

With the advent of small nozzles designed to take sand from a pail or bucket and light enough to be readily carried aloft, the only thing needed was some form of compressed air plant that could be quickly moved around and readily put into service. This need has been filled by the modern portable gasoline or motor driven compressor introduced during the last two or three years.

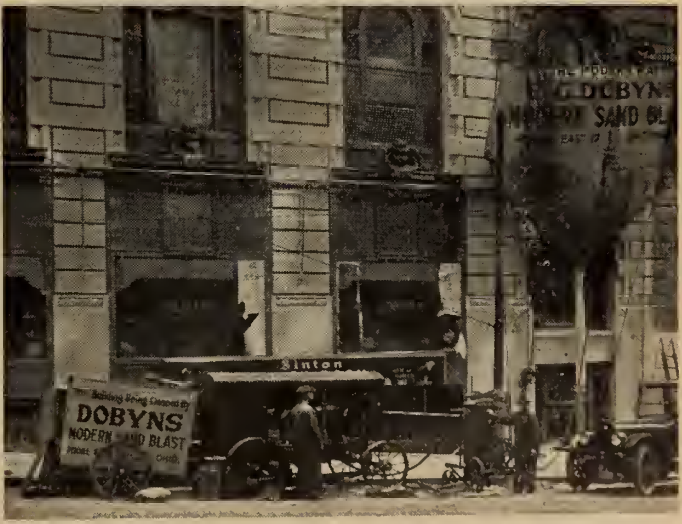
With such equipment the former obstacles have been removed and as a result this rapid and economical method of cleaning the exteriors of buildings is now receiving the attention it apparently deserves.

Smoke, grime and weather soon darken the handsomest buildings in our large cities and there are now a number of concerns in the United States who are making a specialty of restoring these dirt and smoke stained buildings to their pristine colors. One of the most noted concerns of this kind is the Dobyns Modern Sand Blast Company of Cincinnati, Ohio. This firm headed by Mrs. E. G. Dobyns has carried out cleaning contracts in Cincinnati, Zanesville and other parts of Ohio.

The circumstances which led Mrs. Dobyns into this work were a combination of necessity, courage, far-sightedness and unusual business ability. Mrs. Dobyns states that she has always made a point of understanding every detail of her husband's business and that shortly after the war he was offered a chance to engage in a sand-blast business by the former owner who desired to leave town. With no previous knowledge of the business the Dobyns decided to go ahead and after operating for about a year and a half found that their equipment was badly misrepresented and hopelessly out of date. They were temporarily forced to give up the venture for some time and Mr. Dobyns lost faith in the business and engaged in other pursuits.

Mrs. Dobyns, who is a bookkeeper in a florist's shop, decided to try again, however, and several months ago, with a cash investment of $600.00, succeeded in buying a five thousand dollar outfit. This equipment comprised an Ingersoll-Rand 8 x 8 portable gasoline-driven compressor, numerous lengths of hose, a suitable assortment of sand blast nozzles, protective helmets, sand catchers, etc.

Thus equipped, Mrs. Dobyns advertised her willingness to tackle the job of renovating the wide facades of hotels, banks, office buildings, etc., and soon had all the work her men could take care of. In fact, it is said that since its organization nearly two years ago the company has not experienced a single idle day unless so decreed by the weather man. Owners of buildings who had come to regard the grimy smoke stained and weather beaten fronts as inevitable were glad that sand blasting could so effectively do away with blemishes cheaply and without damaging their structures in any way.



Close-up view of portable sand-blast equipment employed by the Dobyns Modern Sand Blast Co.

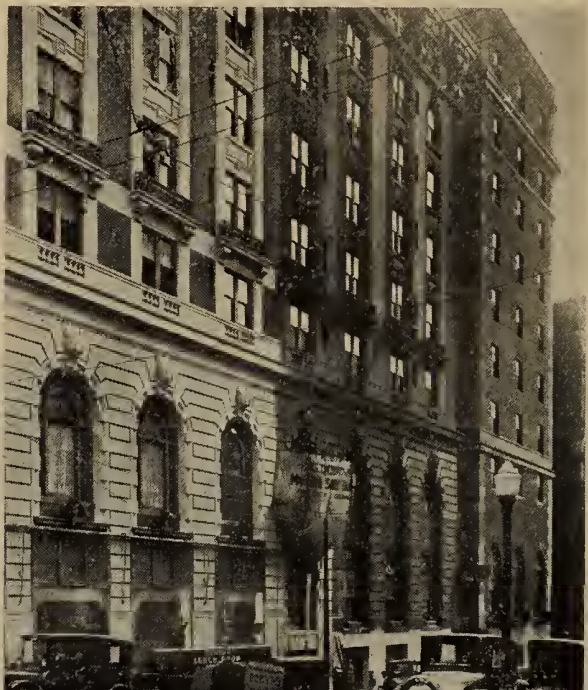
Aside from the value of the results achieved, the business has proved not only a source of pride to its owner but a profitable venture as well. So much so in fact that all of the indebtedness incurred in its establishment was quickly wiped out.

Large Hotel Cleaned by Sand-Blasting

One of the largest buildings cleaned by the Modern Sand Blast Company is the Hotel Sinton of Cincinnati. The curtain walls of this structure are of brick while the finish is of Bedford freestone, such as is used extensively throughout the state of Ohio.

One of the pictures herewith shows the equipment in use on this hotel and also indicates very clearly the sand blasted and untreated areas. The general effect is as if the sun were shining on one portion while the rest of the building remains in shadow.

The compressor employed is capable of maintaining a pressure of 100 lbs. per sq. in. but this was found too high when dealing with the freestone. Generally, the pressure required does not exceed 60 lbs. but in order to speed up the work this is sometimes raised to 80 lbs. and 1/4-in. sand blast nozzles used. Due to the abrasive action of the sand it is necessary to change the nozzles frequently. The number of changes made depending on the speed with which the work is carried on.



Portable sand-blast equipment at work on the Hotel Sinton. Note difference between sand-blasted portion and untreated area. The special sand catcher protects pedestrians and saves sand

In dealing with freestone a fine hard silica sand is used. In use, about 25% of this sand is blown away or rendered unfit for further use as the grains become broken up or reduced to dust. The remaining 75% is caught in a special canvas screen or covering surrounding the scaffolding and carried back to the sand blast tank on the ground where much of it is made fit for further use by sifting.

The screen used for this work was the invention of Mrs. Dobyns and her men. From four to five tons of sand a week were required to clean the Hotel Sinton and the gang was able to clean one tier a day. The word tier signifies a surface the width of the scaffold extending from the ground to the roof.

The compressor used by Mr. Dobyns is somewhat larger than is necessary when using a single nozzle, but on the other hand permits two nozzles to be used when this is desirable in order to hasten the work.

Nozzle Arrangement Determined by Nature of Surface

The character of the surface to be cleaned determines whether it is better to employ a single nozzle with high air pressure or two nozzles with lower pressure. The gasoline consumption of the compressor averages 15 gallons per 8-hour day.

A helmeted sand-blast operator at work high up on a modern office building

The writer is indebted to the King-Becker Engineering Company, of Cincinnati, for some of the data contained in this article. This firm states the compressor used for sand blasting the Hotel Sinton has been in constant service since Feb. 1922, on similar jobs throughout the city. During this time no repairs were required with the exception of the radiator tubes which were damaged in transit. Previous to the use of the special canvas screen the equipment was continually exposed to stray particles of falling silica dust.

To Canadian contractors already having portable compressor plants available, this class of work might be a profitable side line. Many railroads are using portable compressor cars for operating portable sand blasting and paint spraying on bridge work. The same compressor that operates the sand blast can also be used for spraying paint or other finishes; thus it becomes a valuable aid to the contractor wishing to specialize in the cleaning or painting of large structures.

Light Railways to Take Place of Roads

Conditions in South Africa are Such that Highways Cannot Solve the Transport Problem—Agricultural Tram Lines and Narrow Gauge Railways Seem to be the Solution

Some interesting comments on the trnasportation systems of South Africa were contained in the address of Major A. J. Beaton, C.M.G., upon his election to the presidency of the South African Society of Civil Engineers for this year. In view of the importance of transportation problems in Canada, it is interesting to compare the situation in our sister colony. Some extracts from the address of Major Beaton follow:

South Africa is entirely dependent on roads and railways for the transport of its inland traffic, there being no available rivers or canals in any part of the Union. The discovery at an early stage in the far-distant, sparsely-populated interior, of wealthy mineral areas determined a speedy construction of railways and practically the total abandonment of the building and maintenance of good roads.

There are about 18,000 miles of roads in the Transvaal Province alone—mostly unmade roads. Therefore, in the whole of the Union of South Africa the cost of bringing these roads into a condition suitable for mechanical traction would amount to, probably, the enormous sum of £50,000,000, a figure entirely beyond what the present financial condition of the country can warrant; consequently, unless the users of the road are prepared to pay for the construction of the roads to carry modern traffic, one cannot look for any great development in mechanical traction on the present-day roads in South Africa.

The ordinary country road, in South Africa, surfaced with gravel 15 inches deep and 18 feet wide, generally costs £1,000 per mile, including small culverts but no heavy bridge work. Such a road will have a life of about ten years, but it would not be capable of carrying a continuous volume of mechanically propelled traffic.

A steam-rolled macadam road would cost from £2,000 to £2,500 per mile, and the upkeep will be costly, due to the climatic conditions of South Africa. The maintenance of a gravel road will cost £100 per mile per annum and a macadam road £300 per mile per annum.

The Johannesburg-Pretoria gravel road costs £200 per mile per annum and the Main Reef road £300 per mile per annum for maintenance, notwithstanding that mine dump rock is handy and plentiful.

The average cost of the cheapest type of branch railway is £3,400 per mile for 3 feet 6 inches gauge, and £2,800 per mile for 2 feet gauge, at pre-war prices.

Roads Cannot Render Good Service

Bearing in mind the high annual cost of constructing and maintaining roads for transport purposes, a cheap type of railway would appear to be a sounder commercial proposition. Where good roads exist today—in the vicinity of towns—motor road transport is capable of dealing economically with "point-to-point" traffic, but transport by road to distant and sparsely populated areas can never attain commercial success under existing conditions.

Sir William Hoy, K.C.B., general manager of railways, in his annual report for the year 1919, says:—

"Many districts in South Africa are capable of great development if they had ready means of transport, but, even allowing for an extensive and continuous railway construction programme, it will be many years before some of them can be properly served. Some alternative and auxiliary means of transport is, therefore, more necessary in South Africa than in other countries. Opinion is divided as to the best means of opening up outlying districts in which railway construction still lies well ahead. The questions of road construction and maintenance undoubtedly present problems here which are absent elsewhere. Climatic conditions impose a serious handicap, especially in inland districts, where it is said the roads are washed away in summer and blown away in winter. If, however, a net-work of good roads is beyond the reach of attainment in South Africa, a thorough investigation is all the more necessary as the best means of solving the transport problem. Until something is done to improve facilities, the general development, of which the country is capable and towards the fulfilment of which there is every encouragement at present, cannot be attained."

It is therefore obvious that road motor transport cannot be regarded as an economic collector of the products of farms nor a distributor of traffic to meet the ends of rural districts. We must therefore look for relief to some other mode of transport.

Agricultural Tram Lines

Mr. W. H. S. Bell, Solicitor to the S. A. Railways, has propounded a scheme which he calls "Agricultural Lines," which I feel certain would solve the problem of rural transport. Briefly Mr. Bell's interesting and novel scheme is this:—

(a) The construction of light, inexpensive tram lines serving country districts and having their terminal point at a railway station.

These light tram lines to have about 20-lb. rails and to be of 2-feet gauge, laid on moderately good earthworks, but in each case having good bridges.

The trains to be run by petrol engines and to carry passengers as well as goods, but the passenger carriages to be of an inexpensive kind, very similar to open tram cars, and everything should be run on the most economical scale, the driver being in entire charge of the train, assisted by a couple of natives.

There should be scarcely any station buildings, and the land to be expropriated should only be about 20 ft. wide, except in cases of heavy cuttings and embankments.

(b) These agricultural tram lines should be authorized by parliament under a general statute, which should exempt the person or company working the tram line from the ordinary risks attached to a common carrier.

(c) The tram lines should be worked not by the railway administration, but by contractors.

They should be subject to maximum tariffs.

In case of complaints of excessive charge by the contractors the railway board should decide the dispute in much the same way as is done by the railway commissioners in England.

(d) The money for the construction of these tram lines should be found by the government, and the contractor should pay by way of rent a sum equal to 5 per cent. or 6 per cent. on the actual cost of construction and rolling stock.

The contractor should give adequate (but not excessive) security for the due return of the line and rolling stock at the end of his period of lease, in good condition, fair wear and tear excepted.

(e) The period of the lease should be ten years, with the right of renewal for another five or ten years, to give the contractor an opportunity of making traffic and recouping himself for the probable lean years at the commencement of his lease.

Savings in Cost

Mr. Bell suggests two districts in the Standerton Bethel area, whence his scheme might be profitably exploited. The two routes detailed would comprise a length of seventy miles and could be built at a total estimated cost of £70,000 at 5 per cent. = £3,500 annual interest. A similar length of the cheapest type of the "standard gauge" branch line at £3,000 per mile = £210,000 at 5 per cent. = £10,550, a difference of £7,000 per annum in favour of the tramway. Furthermore, a saving in upkeep will also show in favour of the tramway a sum of between £3,000 and £4,000 per annum, or a total saving of, say, £10,000 per annum to the advantage of the tram line.

There must also be some saving on the cost of operating the tramway compared with standard gauge, and it is interesting in this connection to quote from an article entitled "A Case for Light Railways," which recently appeared in the London "Times":—

> "It is difficult to make a definite brief statement on the question of working expenses, as they will vary according to the traffic to be dealt with and local conditions, but the actual movement of trains will certainly not be so costly as with standard gauge. The principal objection in the past to a break of gauge has been the increased cost of transhipment, but it is now recognized that this difficulty can not only be overcome, but turned to positive advantage by presenting traffic in the most convenient form and in bulk to the main railways, and by economical power-handling of practically all the traffic carried."

Mr. Bell had apparently in his mind a type of railway somewhat similar to the Pankop 2-feet gauge line which runs along the Springbok Flats, near Pretoria, as being the standard of his agricultural trams. This line is 27 miles in length and was built for something under £700 per mile.

Notwithstanding its somewhat crude construction, this little line has carried the agricultural produce of the settlers along the route for twenty years.

This year it carried 100,000 bags of mealies, apart from teff grass and other agricultural products, but what is the most marvellous revelation is that the settlers appear to be perfectly satisfied with this little railway, which is more than many people are with the main line.

When an area of country served by these "agritrams" is sufficiently developed and traffic warrants a standard gauge line, the tram line can be transferred at a small cost to some other newly-settled district.

Another cheap system of transport which deserves a trial in South Africa, has been patented by Mr. Frank Dutton, M.Inst.M.E., Superintendent of Motor S.A. Railways, under the title of "Roadrails." Fifty miles of this novel and ingenious system of transport is being operated in Uganda. Several short trial lengths are being experimented with in Spain and Morocco and show successful results.

Two-Feet Gauge Railways

The mineral areas and the developed agricultural districts of the Union are already well equipped with excellent railways of the parent-gauge, there are however tracts of country not yet settled, but which indicate potentialities that may warrant assistance from reasonable means of transport. Such districts must be content with a cheaper type of railway than the somewhat high standard now in operation. New lines for such areas should be of the cheapest construction and simplest system of operating until the progress and development of the district can show that the feeder line is a commercial success and also unable to cope with the traffic offered.

There is, however, the important intermediate field where the traffic is not sufficient to justify a standard gauge railway and where agricultural tramways or road vehicles cannot deal economically with the volume of offered traffic. Such a field can be exploited by the construction of a 2-feet gauge line of higher capacity than the type suggested by Mr. Bell but of lighter construction and lower cost than the class of 2-feet gauge railways now in South Africa.

The average cost of the 2-feet gauge lines hitherto built in this country is £2,817 per mile. This unnecessarily high cost for a purely feeder line was due to over-elaborate construction and equipment. Some of the 2-feet gauge lines are built with rails and sleepers similar to those used on a 3 feet 6 inches gauge railway.

The 2-feet feeder line most suitable as an intermediary between the present type of 2-feet gauge and the proposed "agritrams" should consist of:—

Rails = 20 lbs. to 25 lbs. per yard instead of 35 lbs. and 45 lbs.

Sleepers 4 feet long instead of 5 feet 6 inches.

Rolling stock to be substantial but less elaborate than the types now in use.

No station buildings or fencing.

Such a line could be built and equipped for from £1,500 to £1,800 per mile.

Other factors in favour of a 2-ft. gauge line are the greater carrying capacity of its vehicles in relation to the tare weight, compared with the 3 feet 6 inches gauge tracks, the lower operating costs and cheaper maintenance.

Prejudice Against Narrow Gauge

Two-feet gauge railways have hitherto received but scant support and unsympathetic treatment in South Africa, whilst in Europe they have been extensively and successfully exploited. The opposition was due in a large measure to the fixed prejudice of engineers who had no practical experience of the working of so narrow a gauge, and partly also to the misconception of the public regarding the safety and capacity of such a "little railway."

Those illusions should be dispelled by a study of the Pankop line which cost about $700 per mile and which has served efficiently a large settled agricultural area on the Springbok Flats for the past twenty years. An engine on this little railway hauls a 75-ton load over 20-lb. rails on sleepers 3 feet in length. On a 30-lb. rail and 4-feet sleeper track in S.W. Africa a load of 300 tons can be hauled at a speed of 30 miles to 35 miles per hour.

Petrol loco-tractors now in use in England have light axle loads to permit their use on 20-lb. rails. These loco-tractors will haul a load of 150 tons on the level at a speed of five miles per hour, and if necessary can haul 20 tons up a 1 in 20 gradient at four miles per hour, but these loads and speeds can be increased if required by using a large horse power motor.

The Festiniog Railway in North Wales is the oldest 2-feet gauge in the world and as proof of its success, a new 2-feet gauge railway 25 miles long is now in course of construction to link it up with the Snowdon 2-feet gauge railway.

Building Material Requirements of the Bahamas

The cool off-shore breezes determine the type of construction in the Bahamas. According to the Canadian trade commissioner, G. R. Stevens, homes are built to allow the penetration of these breezes, and consequently Nassau and the out-islands favour wooden buildings. The bungalow is the popular type of architecture; walls are single wooden partitions without plaster; floors are single, and window and verandah space is as extensive as possible. The latest hotel—a vast structure in reinforced concrete with hollow tiled floors and walls—may serve to advance cement construction to some extent, but adequate supplies of pine lumber are so near at hand, and labour costs are so relatively high, that the bulk of building in the Bahamas will continue along the same lines as heretofore. Further details from Canadian trade commissioner, G. R. Stevens, follow:

Cement.—The cement business is relatively limited. Beyond the retaining wall which is being built to stop the silting of Nassau harbour, there is no project in the Bahamas which will absorb any quantities of cement. The entire trade of the colony will not amount to more than 2,000 barrels annually. For this small trade a British and Canadian company are competing, and there is but little business or profit for either of them. It is probable that the British business will increase, due to the explicit instructions of the crown agents regarding the purchasing of British supplies for government projects. In addition, close liaison exists between the leading British cement company and the leading British steamship line running into the Bahamas; and this intimacy would be a factor if business of any consequences were to develop.

With regard to containers for the Bahamas, wooden barrels are popular in the out-islands, but there is really little choice as to container for this colony.

Lumber.—The pine woods of Florida are only a few miles from the Bahamas; consequently all the business of this colony is placed there. The entire demand is for pitch pine. White pine is scarcely used, even for interior trim. (It is curious to note that the Bahamas have a considerable lumber industry and that one or two of the out-islands export considerable quantities to Cuba). At the moment building is progressing briskly in New Providence and numerous cargoes of pitch pine are being imported. In addition to dressed and undressed pitch pine, sashes and doors are being imported from both Florida and New York. There is no sale of dimension timber of any account, 2-inch by 12-inch deals being about the largest size which is stocked. For marine use a fair number of both hewn and rough spars are brought each year from Nova Scotia. Very small stocks were carried, as warehousing is expensive and supplies of almost every type are easily obtained at short notice.

Shingles.—There is a good sale for shingles in the Bahamas. Unfortunately for Canadian shippers, no shingle will be accepted except the standard size cypress shingle. The builder in this colony wishes to know what he will get out of each bundle, and therefore will only buy a standard size. The prevalent seller is the 5-inch by 18-inch cypress which comes in bundles of 50. There is little or no sale for any other type of roofing material.

Laths.—Small parcels of spruce and cypress laths are imported occasionally, but the entire demand is negligible.

Plasters, Kalsomines and Distempers.—There is no sale for plasters or gypsum paints in the Bahamas. There are no double walls within, and little use for exterior plasters. A very limited business is done in decorative stucco.

Corrugated Sheets.—Present supplies are British because of better galvanizing, and also because Great Britain has always supplied this commodity. Occasionally hurry-up orders are sent to New York, which supplies a considerably thinner sheet than Cardiff. The popular British gauges are Nos. 24 and 26, but because of the extensive use of lumber, the demand is limited.

Hollow Building Tile Standards Adopted in the U. S.

Manufacturers of hollow building tile together with representatives of distributors and consumers of this commodity met with the Division of Simplified Practice of the U. S. Department of Commerce on October 19, and unanimously adopted as the future standard line eleven sizes of load-bearing wall tile, six sizes of partition tile, one size of furring tile, and one size of book tile. This action reduces former sizes from between 40 and 50 to 19.

A standard weight for each standard size was also adopted. This in itself is a further simplification, as heretofore there has been a great variety in weights of tile of the same size. Agreement was also reached that the permissible tolerance or allowable variation in weight shall not exceed 5 per cent. over or under the standard, also that maximum variation in the major dimensions—length, wdth, and height—shall not exceed 3 per cent. plus or minus.

This is important to architects, engineers, and builders, as the general adoption of these standards will facilitate their work and tend to lower construction costs.

The History of Cranes and Derricks

The Development of Lifting Devices From the Time of Ancient Egypt to the Present—The Introduction of Steam Power Gave a Tremendous Impetus to the Crane Industry

By Industrial Works, Bay City, Michigan

We marvel that the pyramids were ever built. A credit to modern construction with all its mechanical aids, and yet built five thousand years ago—fifty centuries—with nothing but individual man-power. Powerful cranes were unknown of course, but the huge blocks of stone, weighing from 2 to sixty tons, were handled. Man was forced to develop his own power, without even the assistance of a derrick, winch, or block and tackle. Yet these pyramids stand to-day as silent monuments to the memories of these early men of industry and they bear tragic testimony of the hardships endured.

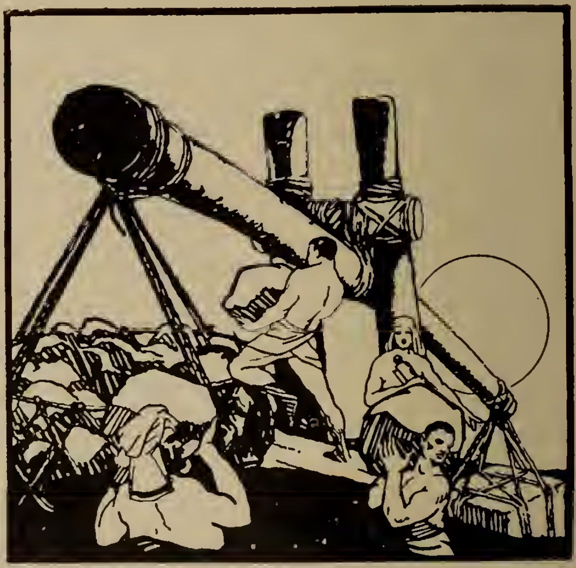
An early block and tackle largely used for handling sails on ships

Although equipment was lacking, men were plentiful, thousands of prisoners of war being enslaved by the victorious Egyptians in their various combats. The Egyptian kings were cruel taskmasters, ambitious to build huge tombs as monuments to perpetuate their greatness, and they were totally indifferent to the feelings of their prisoners. Natives were forced into bondage and made beasts of burden, that the ambitions of these kings might be realized. Placing the huge stone blocks of the pyramids was simply a matter of a sufficient number of men. From what meagre information there is available as to the methods used, we are indebted mainly to Diodorus (40 B. C.).

The roads leading up to the site of the pyramids were made fairly smooth with stone paving blocks. Ropes were then fastened to the stone block which was to be hauled up the incline to its position in the structure. Hundreds and possibly thousands of men were arranged in files each file with its own rope. In order to ease the task somewhat, water and oil were poured on the wooden runners under the load, while pinch bars were used to get it started and to assist it over the rough places on the inclined roadway.

But this was not all. As the work progressed, the mammoth stones must be placed higher and higher, until finally they had to be raised two hundred or more feet above the ground. To do this, huge mounds of earth were built, forming inclined places. Picture for a moment the thousands of men in long files, straining every sinew in their bodies, perspiration coursing down their faces and backs, muscles bulging as they exert every ounce of energy in them. This, day after day for years, under the lashes and curses of the slave drivers. It is difficult for the mind to grasp the amount of human labor that is concentrated in even the one pyramid of Cheops at Gizeh, completed in 3733 B. C. It is nearly 756 feet square, is 451 feet high and is composed of 206 courses of limestone that vary irregularly from 4 feet 10 inches to 2 feet 2 inches in height. The blocks of stone in the mass vary in weight from two to sixty tons, and 100,000 men were employed for 20 years in placing them.

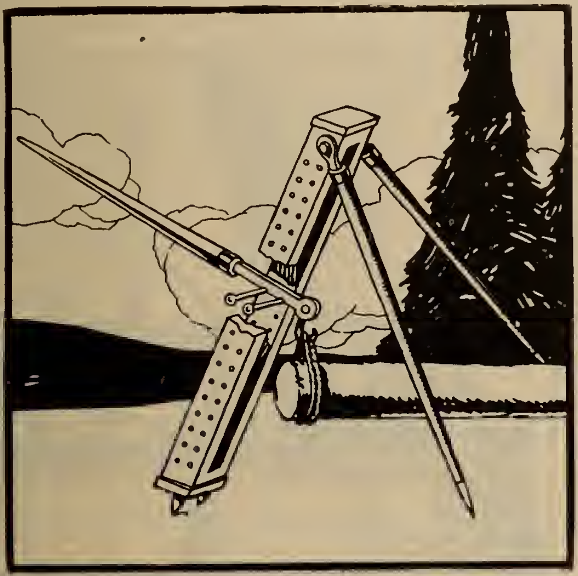
Then compare this with the ease with which the task could be accomplished with a modern locomotive crane such as illustrated here. How easily one of these huge stones could have been lifted, placed on a car, hauled to the pyramids and placed in position. The whole process would have required a crew of less than half a dozen men and would have consumed only a fraction of time which history shows was actually taken.


The shadoof, a machine made of short pieces of wood, used by the Egyptians for handling large stones

The Forerunner of the Locomotive Crane

If we have interpreted correctly the description given by Herodotus, the ancient Egyptians did use a very crude form of crane for handling some of their stones, for he says "a machine made of short pieces of wood" was used. The most noted authorities believe that this machine was used for placing the casing stones on the pyramids, according to "The Mechanical Triumphs of the Ancient Egyptians," by Commander Barber, U. S. N. This contrivance has been named the "shadoof," and it has been used in Egypt for probably fifty centuries.

In this machine, the load was attached to one end of a beam while a rope basket was fastened at the other end. Laborers picked up heavy rocks, carried them up the incline and put them in the basket. They continued this until the weight of the rocks overbalanced the load and thus forced it upwards. After the load was swung around, placed in position and unfastened, the rocks were removed from the basket so that the beam lowered and the same operation could be repeated. The shadoof was the prehistoric ancestor of the modern locomotive crane and it was a marvelous machine for its time.



The lever hoist, a device for lifting heavy loads short distances

The Hindoo "Picotah" — another form of the ancient crane—was used for lighter work, such as lifting water out of wells. This was operated by a man walking back and forth.

Later, prior to 500 B. C., some unknown genius conceived the "parbuckle." This was used by Paeonius, the Greek architect, in building temples. The heavy building stones were padded with pieces of wood so as to make rolling cylinders. Ropes were passed around each of these cylinders, one end fastened to a "dead man," and the other end pulled in by a gang of men. More than twice the load could be handled with the same number of men than by a direct pull and much the same device is now used to handle loads by hand that are too heavy for direct lift.

The Invention of Pulleys

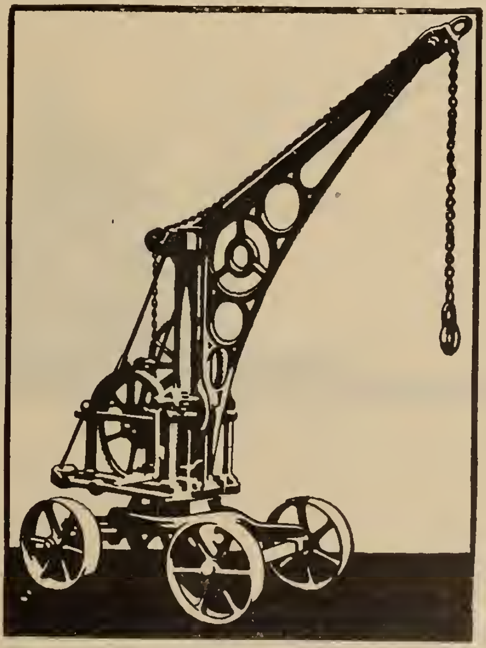
Archytias, a disciple of Pythagoras, is credited with having invented the single pulley about the same time. Previous to this, ropes on sailing ships were run through rings at the top of the mast and naturally this caused wear and friction. The single pulley was a decided improvement.

Archimedes, who lived about 200 B. C., was also a pioneer in mechanical engineering. It is believed that he developed the single pulley of Archytias into the block and tackle, having a number of pulleys and a number of parts of hoisting rope. This enabled him to lift much heavier loads than was possible with the single pulley. His block and tackle was largely used on ships for handling the sails, and possibly for some of the heavier pieces of cargo.

It was Archimedes who said, "Give me a place to stand and I will move the earth." This remark is supposed to have caused Hero, king of Syracuse, to request Archimedes to illustrate his contention that a very great weight could be lifted by a very small force. While full details of the demonstration are lacking, it is supposed that a crude form of block and tackle was used by which a large and heavily laden ship was hauled out of the water onto dry land on a "marine railway."

The early Romans were very well acquainted with the block and tackle, using it extensively in their construction work and in their military operations. They even had a crude form of derrick, called the "corvus," on their fighting vessels. It consisted of a ladder hinged at the lower end to the mast so that it could be swung out over an enemy's vessel. At the walls of their military fortifications a similar device was used to place the soldiers outside of the wall when they were ready to make an attack on the enemy.

In Commander Barber's book is shown a reproduction of a sculpture of a Greek or Roman tomb built about 40 B. C., the original of which is now in the Lateran museum in Rome. It may have been on the tomb of an architect or builder, since it portrays an ancient form of derrick used in the construction of temples. The device even had a treadmill for turning the hoisting drum. This sculpture is doubtless the earliest direct evidence of the use of block and tackle, and it carried the name of "polyspaston," meaning many pulleys.



Maudsley's pillar crane

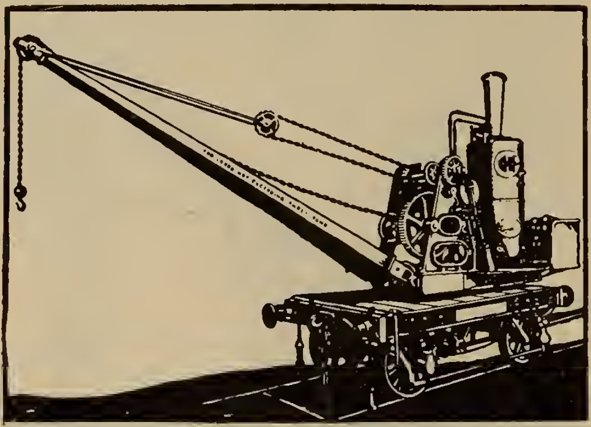
Leonardo da Vinci's Devices

Fifteen hundred years after the beginning of the Christian era there lived in Italy a great genius, Leonardo da Vinci. His accomplishments were many, for he was equally eminent as an artist, an architect and engineer. His sketchbook has been preserved to this day and it contains his working sketches of lever hoists, blocks and tackle and derricks in a profusion of applications. If he could have taken one more step, three hundred years in advance of his time, and invented the steam engine, his genius might have built the first steam locomotive crane. As it was, he sketched a workable design of an airplane, but without power.

The lever hoist is a very old type of hoisting device. During the middle ages in Europe it was quite generally used for lifting heavy loads short distances. One form, as shown here, consisted of a lever with two pins as variable fulcrums, one of which was moved up by hand at each stroke of the lever. In another form, the fulcrum was made of pawls and ratchets which were automatically engaged by a spring. Our modern automobile jacks are much like this form of lever hoist, as are similar modern contrivances.

To overcome the limited lifting range of the lever hoist, the drum and crank was developed. In this evolution the variable fulcrum became a shaft held in rigid bearings and the short end of the lever became the radius of a drum, so that the load could be lifted continuously and for a much greater distance. The long end of the lever was a crank, rotating continuously in one direction.

The treadmill, another form of drum and crank, has been used in Europe for several centuries. Doubtless there are some still being used, as in the olden days, chiefly in the work of unloading boats and raising coal from mines. Loads were lifted by men walking forward in the treadmill, and lowered by walking backward. This was dangerous practice in cases where the load dropped too fast, and the device would certainly not meet with the modern safety requirements of industries on this continent.



An early Appleby steam crane

The Pillar Crane

A set of gears was next developed to increase the power of the drum and crank, and following this was the addition of a boom so that a load could be lifted at some distance from the winch. The third improvement was to place the winch, with its boom, on a post so that it could be made to rotate. Thus was born the pillar crane, dating back to some time in the eighteenth century, the exact date being unknown.

The development of the pillar crane did not stop here, however, because the post was soon mounted on wheels to increase the usefulness of the device. This resulted in a crude form of locomotive crane, the direct ancestor of the modern machine. Probably the first locomotive crane operated by hand power was built by Henry Maudsley in England in 1811. An illustration of this crane is reproduced here.

The remarkable development in cranes really began with Watt's invention of the steam engine toward the end of the eighteenth century. Following this invention, came Stephenson's locomotive and Fulton's steamboat early in the nineteenth century, coincident with experiments in the application of steam to locomotive cranes.

The First Steam Locomotive Cranes

The first steam locomotive cranes were built in England. It is not clear from available records just who built the first steam locomotive crane or where it was built, but "The Engineer," of London, for May 28, 1909, sheds some light on this question. The first of a number of stationary steam derricks was built by James Taylor of Birkenhead in 1839. These had single-cylinder vertical engines with fly wheels, which Mr. Taylor says he found dangerous. Accordingly, in 1853 he took out a patent for a steam winch, including the application of link reversing motion, with double cylinders and no fly wheel.

Modern locomotive crane

The designing and building of the first steam locomotive crane was carried on between the years of 1852 and 1858. It appears the design was made by W. W. Hulse and the crane built by James Taylor.

There is definite record of a steam locomotive crane built by Taylor in 1859 or 1860 and supplied to W. W. Hulse. The drawing in "The Engineer" shows that it is of wonderfully good design for an early crane. It is full revolving with a variable radius boom, vertical engines, a short locomotive-type boiler, and the whole mounted on a neat four-wheel railway car.

Independently, and at about the same time, the Appleby brothers, of London, built their first steam cranes, but their first one came out a few months later than Taylor's crane. C. J. Appleby felt the need of something of the kind when erecting bridges in Russia in 1851, but it was in 1861 when they brought out the first crane. It was a rather crude machine, as may be seen by the illustration above. They developed and improved this crane and their product was soon used all over the world. Their hand cranes were exhibited at the International Exposition at London in 1851, and their steam cranes at Paris in 1867, and Vienna in 1873. They issued a catalog in 1869. It is recognized, therefore, that America is indebted to England for the first locomotive crane. Appleby brothers' cranes were used and exhibited at the Philadelphia Centennial Exposition in 1876, where they gave rise to much favorable comment on account of their excellence and remarkable capacities as labor savers. In 1883 Mr. C. J. Appleby visited this country and addressed a meeting of the American Society of Civil Engineers on "Cranes as Labor Saving Machines." He brought out points concerning their flexibility of application that are still true to-day of the modern locomotive crane.

The American Construction Council Suggests How

To Prevent A Congestion of Building

Carry on Maintenance Work in the Closed Season and Start New Projects Earlier than is Ordinarily the Case—Efforts Being Made in the U.S. to Rectify Troubles of the Industry

Urging all those interested in building projects in the near future to undertake such work so far as possible at an early date in order to take advantage of the usual slackening of demand for materials and labor during the winter months and in this way avoid a possible building crisis in the spring, the American Construction Council today made public through its president, Franklin D. Roosevelt, the resolutions adopted at the recent annual meeting of the council in regard to the condition of the building industry generally. In addition Mr. Roosevelt announced the particular program of action for the coming year which was decided upon at that time, subject to the approval of the executive committee, which includes very definite aid to be rendered by the Council in securing apprentices in certain of the building trades, and the establishment, through the support of the council, of local so-called "building congresses" throughout the United States modelled on those which have proved so successful in many large cities. Mr. Roosevelt, in giving out the statement said:

"The American Construction Council, considering the fact that it is entering an entirely new field and embodies an entirely new idea in associations, has made, in my judgment, splendid progress during the past year. I feel that its appeal for support from the public and from those associations in the building industries has been well justified by the work it has already done and will be increasingly justified in the future.

Establishment of Local Associations

"As the main effort of the council is to bring together for the first time all persons or organizations interested in construction or the manufacture or supply of materials for construction, together with the labor that enters into construction, and to act for them in bringing to the attention of the public what is needed to keep on a fair basis the costs of construction, it was the unanimous opinion of those present at the recent annual meeting that the formation of local get-together associations is an essential step in this work. The National Congress of Building and Construction Industries, had already inaugurated this movement and the practical method decided on by the Council to secure this local co-operation was embodied in a resolution by which the American Construction Council not only pledged itself to support and aid the creation of local building congresses in every possible way, but authorized the Executive Committee to expend from such funds as might be secured, money up to $25,000 in assisting in this work. By this co-operation the American Construction Council will secure local associations of those interested in the construction industry and the local building congress will find in the American Construction Council a national organization which will act as a medium of interchange of ideas between them.

Overcoming Labor Shortage

"It was also brought out that there is a real scarcity of skilled labor in several of the building trades which made it impossible to secure workmen in many localities during peak periods at any price whatever. In other trades, the council has already discovered a local shortage in one place and a local surplus in another. In such cases, rather than encourage new apprentices in the trade, the efforts of the council will be devoted to adjusting these conditions. One of the most immediate and effective ways of remedying these conditions is, of course, securing young men to enter the trades where there is a real national shortage. Accordingly the council has by resolution undertaken as part of its program for the year the encouragement of the establishment and strengthening of schools for apprentices and the securing of desirable pupils therefor in every way that lies in its power. For this purpose a committee on apprenticeship, vocational guidance and craftsmanship was directed to co-operate with employees' and employers' organizations and with educational bodies, local and national, in providing for apprenticeship training. The obvious danger of overnaming trades which have already plenty of apprentices has been recognized by the council and the committee on aprenticeship, in addition to the information already on hand regarding several trades, will, under the resolution of the council, carefully ascertain that there is a real shortage in a trade before recommending would-be apprentices to take up such a trade as their profession.

"A national crisis in the building industry led the American Construction Council to issue a statement in the Spring urging that for a few months unnecessary building be suspended. The result of this announcement, I think, did much to prevent a possible very serious situation. A careful study of the present conditions has now been completed by experts of the council and the following statement was prepared for issuance to the public:

"In the spring of this year the American Construction Council advised the public of the desirability of curtailing construction work so that its volume would not be so great that the labor and material available could not possibly carry through. Had the larger volume been undertaken it would have resulted in raising the cost of construction to prohibitive prices which would have caused a break as occurred in 1920. This happily has been averted. The result of this advice, together with the co-operation of others, was that a large volume of construction work then under contemplation was not undertaken and the prices of construction did not rise to the breaking point.

"Having in mind the great desirability for a longer working year in the construction industry, the benefits of which would accrue to the public, the contractors, the manufacturers, the transportation companies, and the various trades, and which would be helpful in reducing the seasonal peaks of construction activities which are conducive to increased costs, and further recognizing the general tendency at this time of the year to defer building projects until spring, the American Construction Council suggests that cognizance be taken of the following:

"1. Maintenance, repairs, and alterations of existing structures, through long custom rather than through any other reason are carried on during that portion of the year when new construction is most active. It will be in the interest of all concerned to do such maintenance work as is possible during the closed season and now is the time for owners and managers to give this full consideration.

"2. Miscellaneous new construction that should not take more than four to five months to complete can ordinarily be undertaken in the fall and carried on under more advantageous conditions which will result in satisfaction all around, at the same time giving continuous employment to workers who might otherwise be idle.

"3. There appears to be a continuing demand for construction of large projects. It is perhaps too early to predict that this will result in an abnormal demand for labor and materials next spring, yet there seems to be such a trend. Therefore, until the season is further advanced and this can be determined more definitely, the situation in many localities suggests caution as indicated in the report of the American Construction Council of last spring. However, such necessary construction as is to be done should be arranged for now and the preliminary work undertaken at an early date so as to gain the advantage of all favorable periods for progress between intermittent interruptions caused by inclement conditions and in addition relieve as much as possible the congestion that may come in the spring.

"4. The American Construction Council is considering the economic aspects of the construction industry as they affect the people as a whole and this statement is not intended to apply to those localities where the supply of labor is ample and weather and climatic conditions will permit construction work to go forward normally."

What Will Building be Like Next Year?

Since Canadian and U. S. Conditions are Closely Related, These Opinions Respecting Prospects on the Other Side Will be Interesting and Helpful

What will be the status of construction during 1924? That is a question that is just now beginning to interest contractors, who are looking for facts that will guide them in their forecasts. In this connection it is always interesting to note the prospects in the United States, since they have an important bearing on conditions in this country. According to indications drawn from statements of leading general contractors and other observers of the trend of operations, conditions affecting construction activities next spring in the United States will be closely similar in character to those which prevailed at the opening of the eccentric building season of 1923. These statements obtained by the Associated General Contractors of America also seem to coincide upon the thought that owners and others will do well to use caution next year in timing their operations, lest a "mad market" for labor and materials, such as threatened early this year be encountered and the entire situation become demoralized.

The belief in some quarters also seems to be that an unusual amount of work is to be undertaken for completion during the first months of 1924. In some sections of the country, where the deficiency in buildings is especially noted, leaders are advocating that winter construction be urged, with a softening of prices of materials and of wages being held as inducement for this step to be taken to avert an extraordinary demand during the months when construction most ordinarily is placed under way.

Many of these individual statements deal directly with the question of whether curtailment of operations, such as was advocated and initiated by the Associated General Contractors of America last Spring, be held as policy next year to avoid run-away prices of materials and costs of labor, or whether a relaxation, perhaps entire absence of action, will be more advisable.

Quotations from a number of the statements follow:

James Baird, George A. Fuller Co., New York.—Judging from the permit record covering the period of June, July and August, there is assurance the country in general having a large building program for this coming year; consequently, I look for a very serious labor shortage again in the spring. There is so much speculative work contemplated that I do not think it would be desirable to encourage it too much. Personally, I would prefer to see a reasonable amount of the work postponed until we are assured of a more ample supply of labor and material.

H. W. Baum, H. W. Baum Company, Salt Lake City—It is our opinion that there is not likely to be a situation during the coming year which will require curtailment in any substantial form in the construction activities of the intermountain district.

L. C. Wason, Aberthaw Company, Boston.—My forecast for the future is that there will be slight reduction in building costs through the winter, due to softer spots in the material markets and increased labor efficiency, but that the usual spring building activity will bring costs back to about the present level. Therefore, a "Build Now" campaign for fall and winter is in the line for stabilizing the industry and giving the investors a square deal.

Sumner Sollitt, Sumner Sollitt Company, Chicago.—Men available for construction are now plentiful. I thoroughly believe that no propaganda at the present time, whether for obstructing or accelerating the desire for contemplated construction, is necessary. Moderate price residential work will go ahead in volume just as soon as owners are sure they can obtain value received. Building construction on railroads is becoming more active and certainly much is contemplated. Manufacturers seem to have had a good year and expansion seems to be still their desire.

W. F. Austin, W. E. Wood Company, Detroit.—It would seem to us, from our very limited knowledge of the situation, that the safest plan would be to advocate that for the next six months, at least, the building construction be confined to those structures most urgently necessary. Doing this not with the idea that costs may be lowered after that period, but with the thought that unless something of this kind is done costs will again reach the point where a general let-up and universal discontinuation of construction operations will be the result.

A. S. Downey, A. W. Quist Company, Seattle.—Taking everything into consideration, it would seem a wise policy at this time to encourage building construction so that we may gradually bring our building program to meet the present demands.

Henry Ericsson, Henry Ericsson Company, Chicago.—The after-effect of the war had a very peculiar influence on things in general. It seems to me that everybody is having more money and lives on a higher plane that before the war; this creates a demand for more buildings than was required before the war. That is one of the reasons for the building rush in the past and it may be the reason for its continuance for another year or two.

S. B. Haux, The American Construction Co., Houston.—It is my observation in this locality that further curtailment of building operations is essential to the good of the cause, due to the unprecedented demand of labor.

Otto M. Eidlitz, Mark Eidlitz & Son, New York.—I believe that wages are probably fixed for the next two years, and that the price of building materials will vary somewhat during the winter months.

The work that would normally come out to meet the still unsatisfied demand for housing and additional business accommodations, as well as the starting up of the work that has been held up during this year, will make 1924 a big year in the building industry.

T. T. Flagler, The Flagler Company, Atlanta.—This is a very general view. In particular we are interested in construction only in the South and throughout this territory it is my opinion that further building under present conditions will be profitable to the owners in something like 90 per cent of the territory we cover, and this is the real criterion which should cover the volume of construction.

Archibald M. Woodruff, third vice-president, Prudential Insurance Company.—At the present time we are having a very large demand for mortgage loans to be secured by complete structures, and we have recently declined a number of applications for construction loans. From the information we have received, it is my opinion that there will be an excessive demand for labor in connection with building construction work for several months at least, particularly in our larger cities.

H. C. Turner, Turner Construction Company, New York.—As to business conditions in the future, most of the factors seem favorable for good business, but we have had a bad wheat situation, a disorganizing oil industry and uncertain legislative prospects.

Having in mind the great volume of work offered this past eight months, only a part of which could be built, it would seem foolish if the country did not give full employment to all competent workmen during the coming winter and year 1924.

The President of a leading Engineering Society.—I am glad that the construction program was curtailed some few months ago, and while I think that at this season it is not likely to run away, yet I believe that caution is necessary lest the program for the next year be made too ambitious and we start out at the beginning of the 1924 construction season with a bigger program than can be put over, with the consequent result that the precedents will be artificially boosted.

The Comptroller of a leading Life Insurance Company.—As to the trend of construction activities, I do not see any likelihood that they will be dismissed. I think the country is still behind in its construction program as to buildings used for residence purposes and business buildings. I have no information on factories, as we do not lend on factory properties, but I think it is likely that it will be some time before the building program has reached the saturation point.

H. N. Leighton, H. N. Leighton Company, Minneapolis.—As to the advisability of relaxing the curtailment of building operations advocated earlier in the year, it is our judgment that this should be done. This statement is based on the impression which has come to us especially during the past six months, during which time there has been a very pronounced decrease in the amount of work offered for figures, and if anything can be done to counteract this tendency it would seem to be highly advisable.

L. J. Horowitz, Thompson-Starrett Co., New York.—I am of the opinion that conditions have been considerably improved but that the time has not yet arrived when it can be said that the industry has been stabilized to a sufficient extent to make it prudent for an owner to embark upon a building operation to which he is not committed. There will, of course, be exceptions to this rule. There are some situations which will warrant an owner to proceed notwithstanding high costs, because his needs for space are so great as to overshadow the disadvantage of high costs.

The resignation of Mortimer E. Cooley, dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the Executive Board of the Council held in Rochester, N. Y., on October 12.

Construction Developments During the Month of October

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, October, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	3	$ 44,000	2	$ 185,000	....	$...........	....	$...........	5	$ 229,000
Churches	7	97,000	6	382,800	....	....	1	10,000	14	489,800
Factories	17	309,500	5	565,000	1	12,000	3	13,500	26	900,000
Public Garages	15	109,200	6	56,000	1	10,000	2	9,000	24	184,200
Hospitals	1	2,800	....	....	....	....	....	....	1	2,800
Hotels and Clubs	10	422,000	2	11,000	2	165,000	2	19,000	16	617,000
Office Buildings	6	448,000	1	50,000	1	3,500	....	....	8	501,500
Public Buildings	6	319,900	3	8,600	....	....	....	....	9	328,500
Residences	861	3,967,500	535	2,815,100	3	8,000	23	107,500	1422	6,898,100
Schools	4	223,600	3	92,000	....	....	1	4,000	8	319,600
Stores	30	357,000	8	146,000	....	....	3	34,000	41	537,000
Warehouses	9	693,300	2	10,000	....	....	2	15,500	13	718,800
Total Buildings	969	$6,993,800	573	$4,321,500	8	$198,500	37	$212,500	1587	$11,726,300
Bridges	7	67,800	1	1,300	3	30,800	....	....	11	99,900
Dams & Wharves	3	100,500	7	270,600	....	....	6	53,900	16	425,000
Sewers & Watermains	17	453,600	3	18,500	4	78,000	1	5,000	25	555,100
Roads and Streets	40	1,220,900	19	674,300	8	57,400	6	50,600	73	2,003,200
General Engineering	7	368,800	6	9,864,500	1	3,600	2	65,200	16	10,302,100
Grand Total	1043	$9,205,400	609	$15,150,700	24	$368,300	52	$387,200	1728	$25,111.600

Construction Contracts Awarded in Western Canada, October, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	3	$ 560,000	....	$...........	....	$...........	....	$...........	3	$ 560,000
Churches	2	75,000	....	....	1	6,000	1	3,000	4	84,000
Factories	4	377,000	1	1,800	2	9,500	2	41,500	9	429,800
Public Garages	1	9,500	3	9,700	2	4,500	3	10,600	9	34,300
Hospitals	2	41,000	....	....	....	....	1	10,000	3	51,000
Hotels and Clubs	4	23,000	2	17,300	....	....	1	6,000	7	46,300
Office Buildings	1	10,000	1	3,500	1	2,300	1	3,000	4	18,800
Public Buildings	2	43,500	2	33,700	1	4,700	2	50,800	7	132,700
Residences	67	275,300	30	76,500	33	125,600	70	270,100	200	747,500
Schools	3	9,400	2	44,200	6	53,500	....	....	11	107,100
Stores	8	28,600	2	5,700	3	19,500	4	20,900	17	74,700
Theatres	3	17,000	....	....	....	....	....	....	3	17,000
Warehouses	4	30,000	2	26,500	2	24,000	....	....	8	80,500
Total Buildings	104	$1,499,300	45	$218,900	51	$249,600	85	$415,900	285	$2.383,700
Bridges	67	1,868,300	....	....	1	1,200	13	8,200	81	1,877,700
Dams & Wharves	2	10,700	1	1,000	....	....	....	....	3	11,700
Sewers & Watermains	1	14.500	....	....	....	....	1	3.900	2	18,400
Roads and Streets	36	470,100	....	....	4	47,500	7	59,400	47	577,000
General Engineering	1	58,000	....	....	....	....	1	40,000	2	98.000
Grand Total	211	$3,920,900	46	$219,900	56	$298,300	107	$527,400	420	$4,966,500

For the Building Supply Dealer

Ideas that Enable the Dealer to Sell More Flooring

How Dealers Can Capitalize on Displays and Advertising—Methods That Have Been Found Effective by Experience

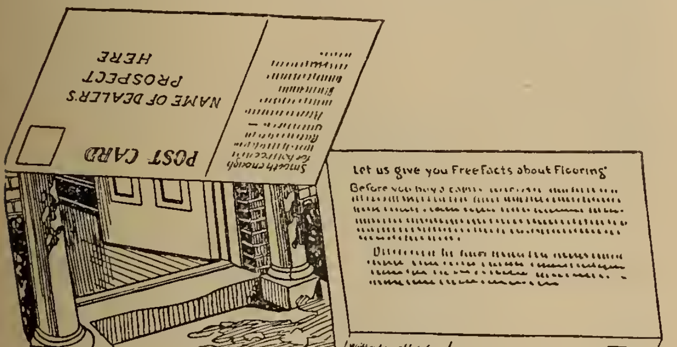
By the Maple Flooring Mfrs. Assn.

(Continued from last issue)

There is one form of business-getting advertising which costs you no more than the effort of slipping an extra sheet of paper in each envelope that goes out. You have already paid your 2 or 3 cents postage, why not get all the value that you can, by adding an extra idea to every letter you mail? This applies to sending out statements, to routine correspondence, and to any systematic mailing you do.

As suggested above, the literature already mentioned is to be enclosed in all outgoing mail. But you can also afford to use the mails for the definite purpose of finding business. For this purpose a card may be used which carries also a reply card, which the prospect can tear off and mail, requesting additional information. When the reply card is received, you can usually afford to follow it up in person or send a salesman, and the envelope stuffers mentioned above will serve as a specific reply if you answer by mail.

On the back of this card will be the picture of a worn stone doorstep beside a Maple floor, which has been used with remarkable effectiveness in magazine advertising. Beneath this picture will be the caption "A Floor of Captive Sunlight which has Outworn Stone."


NAME OF DEALER'S PROSPECT HERE
POST CARD
Smooth enough
Let us give you Free Facts about Flooring
Without any obligation
YOUR NAME AS DEALER IMPRINTED IN THIS SPACE

A postcard suggestion

On the address side of the card will be a message reading as follows:

Smooth enough for ball rooms—
Beautiful enough for homes—
Clean enough for hospitals—
Hard enough for factories—
Hardwood Floors are truly unequaled in service and economy. See our offer inside.

When the card is opened to the inside, the lower half will be perforated, carrying your address, so that it can be torn off and mailed back to you, and the upper half will bear the following message:

> Before you buy a carpet—before you build a new home—or remodel your old one—before you plan a store or factory—hotel or club—a school house or hospital—it will pay you to investigate the qualities, grades and uses of hardwood flooring.
>
> Read more about these floorings which are unequaled for wear, versatile in color possibilities, and moderate in price. Send the card below for the information which interests you most.
>
> **(reading matter to go on lower half of card)**
>
> Without any obligation to me, please send me the literature which I have checked:
>
> Color Harmony in Floors.
> Floors for Educational Bldgs.
> A Floor of Captive Sunlight which Outwears Stone.
> The Floor which the Years will make Precious.
> Roller Skates—and Service Floors.
> New Floors for Old.
> Name..................................
> Street..................................
> City..................................
>
> Place 1c or 2c stamp here
>
> Your name as dealer imprinted in this space

How to Use This Card to Get the Most Business

This card is written to appeal to everyone. You can send it to farmers or factory owners, home owners or retail store owners. You could almost take the telephone directory if you live in a small community and get a fair percentage of returns by mailing the card to every name in the directory.

One way to use this card is to assign some bright youngster in your organization, the job of finding names to send this card to.

And remember this about people who answer this card about floors—everybody who has a floor has a building to contain that floor. Flooring is a product of universal appeal. If you can get an inquiry about flooring, it opens the way to sell other materials.

How to Use Newspapers to Get More Business

You have to search for names when you want to use the mails to get business. The newspaper already has the names—it circulates to the people of your community—the people who are naturally interested in your city and trade in your city, even if they do not live in the city. Figured on the basis of the number of names you can reach in proportion to the cost, the newspaper is the cheapest method of reaching the greatest number of people. The question is, "How can you get people to read your advertisements—how can you get them to act upon them—how can you prove to yourself that your advertising in newspapers is paying for itself and paying a profit on the money invested?"

This is a subject for a book in itself, but some general rules and some specific help will be given here.

The first thing to remember is that people read a newspaper for news. A woman reads department store advertising for the news of new styles or new fabrics which she might want—for special prices which might attract her.

Good advertising is good news. How can you put "news" into your advertising? How can you make it interesting?

The first rule is "BE SPECIFIC."

Do not try to cover everything in your yard. If you do that, you are using the newspaper as a sign board.

Pick out some one thing and drive at that.

If you want to get enquiries for 3/8" flooring, for covering old floors, figure out what it would cost to floor a typical room—say 12 x 14—and put the price in your advertisement. That is news. For instance, your advertisement would read like this:

Is Your Living Room 12 x 14 Feet?

It will cost you only $00 for a new hardwood floor

Why pay for carpet when you can cover an old floor in your home with a beautiful, clean, sanitary, stylish hardwood floor for less than the cost of a good carpet?

Hardwood floors, waxed or varnished, are essential to the modern home. They increase its value if you want to sell. They are easier to clean, and attractive in appearance.

Let us estimate the cost of new floors for your old home. Call in person or telephone for the new floor style booklet, "Color Harmony in Floors."

YOUR NAME HERE

Of course, the price should be shown in the advertisement above, to suit your local conditions.

Suppose you wanted to follow up this advertisement with another along the same line, and still keep the news. You could use the following:

"New Floors for Old—$00 to $00 per Room!"

You can have a beautiful new hardwood floor at a cost of $00 for the flooring, if your living room is 12 by 14 feet. Even if your room is 16 by 18 feet it will cost only $00.

You can lay the special 3/8" Maple, Beech or Birch flooring right over your old floor and get all the beauty and modern style which these floors will give to any home.

Come in and talk to us about floors for your old home or your new one.

YOUR NAME HERE

Put news in the ads. It appeals to the person's pride, curiosity, economy. It aims to sell a single idea which will get the person in touch with you and permit you to sell them actual goods. It is the way to get results from advertising—to combine advertising and salesmanship to make the greatest profit. Many other advertisements along the same line could be shown.

Another way in which advertising may be used might be mentioned here. That is, using advertising to sell an idea, a new business policy, to the public.

For instance, suppose you decide to avoid credit business by giving a cash discount of 5%. You could make this a positive business-getting asset by such advertisements as the following, addressed to the public.

You Save $5 on Every $100
Because
We Save $5 Per $100

When you pay cash for building material purchased from us, we give you a straight 5% discount—$5 saving for you on every $100 purchase.

We can do this because we have found by analysis that it costs us this much to carry charge accounts on our books and collect them.

You save money—we save money. Take advantage of this opportunity when you want building material. Think what a saving this would mean if you were building a whole house!

Whether it is a house, a barn, a dog house or a chicken coop—anything you want to build with lumber—let us supply you for cash at a saving of money.

YOUR NAME HERE

Address Telephone number

Whatever you advertise, shoot at a definite mark. Get an idea which means definite saving, a definite opportunity, and definite desire on the part of the public. Then you will see a volume of returns from your advertising which is worth while.

All the advertisements shown above can be used in a single column space in the newspaper and will take only five or six inches in depth. If you wish to use large space, they will, of course, get more attention.

How Service Brings More Business

One man puts news into his advertising by running a floor-laying and finishing department in connection with his flooring department. An address reported by the American Lumberman, said in part,

> "We have a department which hand-scrapes, sands, fills, shellacs and waxes floors ...... it gives a completed price for the job ...... we advertise that we will lay a hardwood floor over the old one in the living room, say 12 x 14, for $70 complete .... less than the cost of one carpet.
>
> "We also have an electric sander which we rent out by the hour, with operator, to sand old floors ...... it can cover about 1,000 square feet a day."

Suppose you were a home owner, the owner of a ball room or skating rink, and you wanted a new floor. Who would get your business—this dealer, who is equipped to quote you a price for the complete job—relieve you of all trouble about laying and finishing—and guarantee the finished job—or his competitor who simply sells you so many feet of loose flooring and lets you shift for yourself in getting it laid and finished?

Of course, not every yard can afford to maintain an electric sander and a man to operate it—but suppose you were in a small town, and arranged to get a sander and operator from a nearby city for a limited time in the future—and then suppose you went after people on the strength of the prospect—wouldn't that be news for your advertising, and a way to get people to decide to buy at a certain time?

No Hope of Cement Reduction in British Columbia

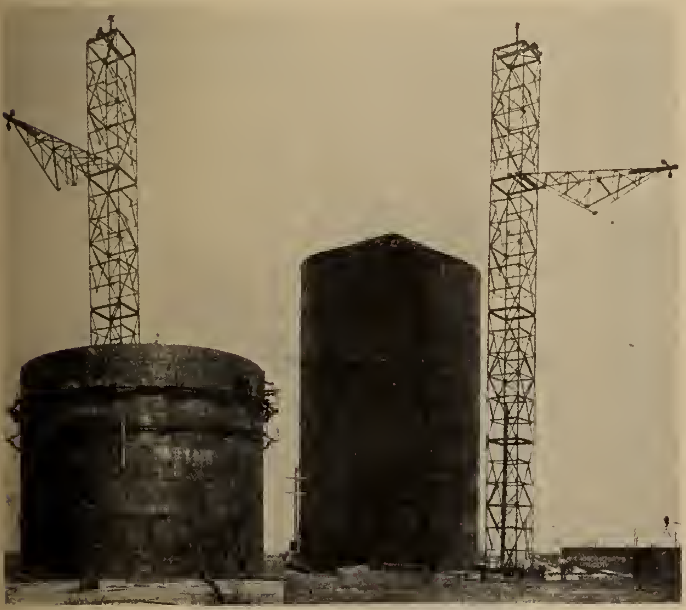
Mr. J. C. Tomlin, manager of the British Columbia Portland Cement Company, in a statement made to the Vancouver Builders' Exchange, has stated that on account of the condition of the company and because of the small market and, therefore, the small production, any revision of the cost of cement could not be hoped for. The company have never earned more than 3½ per cent. on their investment, it is claimed, and only one of the two plants which they own is now in operation. Heavy government taxes were stated to be one of the causes of the high price of their product. Mr. Tomlin replied to the criticism that the company sold cement to the government for less than was charged to individual contractors, by stating that what the company was really doing was selling the cement to the government at cost in the hope of encouraging greater use of concrete paving. This result had been accomplished to some extent, he pointed out, and many municipalities had taken up the idea of building concrete highways.

Hints for the Contractor

Roof Truss Derrick Erects Standpipes

The illustrations herewith show the erection methods used in the construction of the two standpipes now being built for the city of Dallas, Texas, by the Chicago Bridge and Iron Works. This work is very interesting, inasmuch as the design of the apparatus used and the erection method followed are both new and original.

These standpipes are 60 feet in diameter and 100 feet high. The design is very heavy, the plates in the lower course being 1-7/16 inches thick, approximately seven feet wide, 24 feet long, and weighing more than 10,000 pounds each. The plates in the successive courses higher are the same size, gradually decreasing in thickness and, consequently, in weight; those in the top ring weighing something over one ton each. A large portion of the plates in these standpipes were so heavy that they could not be hoisted into plate buggies and moved in the customary manner. Conditions seemed to demand some form of derrick capable of easily hoisting and handling these heavy plates, the most desirable type being one that could raise all the plates and handle all the material at one setting. The problem, therefore, was to provide, at a comparatively small expense, a 35-foot boom derrick capable of raising material 100 feet in the air, and able to turn a complete circle.



Standpipes were erected by means of derricks framed from the standpipe roof trusses

The cost of a specially built derrick of the proper dimensions, to be shipped to the work and then taken away, was prohibitive. A wooden staging could be built to support a small derrick, which, however, could not be easily rigged to swing a complete circle without moving either guys or stiff legs, and which would be clumsy and cumbersome in operation as well as difficult and expensive to install.

These standpipes are covered with conical steel roofs which are supported by a series of 24 radial trusses. The happy thought suggested itself that the trusses themselves could be so detailed that they might be used to form the derrick desired. The illustrations show how sucessfully this idea has been developed.

Sixteen of the trusses were used in assembling the mast, which is approximately 130 feet high and 8 feet square. The boom, 35 feet long, is made of two trusses. There being 24 trusses to each standpipe, the derrick was located out of center so that the six remaining trusses could be raised and placed in final position before dismantling the derrick.

The derrick is operated in the usual manner with double-drum engine and swinging gear. The hoisting cables lead to the bottom of the derrick and out to the engine through small holes drilled in the bottom ring. The engine is operated by compressed air, which we had to provide on the work to operate riveting hammers.

Incidentally, it may be of interest to cite that the bottom of these standpipes are welded throughout, thus assuring perfectly tight work in that portion of a standpipe which, when riveted, is the most difficult to make tight, and when leakage does develop, is the most troublesome to overcome. The roof plates are also welded, which will insure a fine, smooth appearance. The shell plates are riveted, and being so thick, require massive double butt strap joints, which can be seen in the pictures.

The photograph at the left shows the first standpipe with seven rings in position, and in the foreground the bottom of the second standpipe. The right-hand photograph shows the first standpipe completed, the roof trusses in position and the derrick for the second standpipe in the act of raising the first plate of the lower ring.

Mr. Adolph Eastman, superintendent in charge of the work, reports that the entire scheme was worked out in a very satisfactory manner. While there is no doubt that this successful achievement is partly due to the care and thoroughness with which the design and material were prepared, the greatest credit must be awarded Mr. Eastman for his skill and the interest he had portrayed at all times in the work and the methods pursued.

Device for Painting Centre Line on Highway

Many localities have adopted the practice of painting a line down the center of the highway as a device for furthering the safety of travel thereon by confining automobiles to their own side of the roadway. For this work one state on the other side has adopted a simple device consisting of a paint receptacle carried on a three-wheel hand-truck from which a hose leads to a paint brush attached to the front of the device just back of the front wheel. This brush applies the paint to the surface of the highway, and a second brush a few inches back of it spreads the paint to the proper width. A red chalk line is marked on the pavement ahead of the paint spreader to guide the path of the latter. A truck follows carrying wooden standards which are placed over the painted line about 15 feet apart to protect the paint from vehicles while it is fresh.

Painting Iron and Steel Surfaces

Facts regarding the painting of iron and steel of value to builders and contractors have been developed by a committee of the American Society of Testing from an elaborate series of field tests. The following important points have been developed:

1. The thorough methods of preparation, i. e., sand blasting and picking, show no superiority over ordinary methods of removing loose scale, rust and dirt by scraping, brushing and wiping. This applies to both new steel and old steel which has been in service.

2. Weathering to permit loosening and partial removing of mill scale before painting is inimical to preservation.

3. Painting in a cold dry atmosphere gives results as good as in warm dry atmosphere, or on heated steel. (This may be due to the greater thickness of coatings applied in the cold atmosphere).

4. The preparation of old painted steel surfaces which have bare rusted spots, by brush coating with benzine over and around the rust spots, burning the benzine off and then scraping and wire brushing, gives better results than scraping and wire brushing without the benzine treatment, and better results than sand blasting.

5. There is no difference observable in the results of the application of the same methods to old and to new steel.

Foreign Trade Inquiries

The following trade inquiries have come into this office. Further information may be obtained by those interested from the editor by quoting the number indicated:

2985. Steel Wheelbarrows.—Manufacturers' representative in Buenos Aires wishes to represent Canadian manufacturers of steel wheelbarrows.

3002. Cranes; Bars.—A Brazilian firm wish to hear from Canadian exporters of cranes, iron and steel bars.

3011. Tubing, Iron and Steel Bars, etc.—A London firm, which buy for customers in India and the East, are open to purchase wrought iron tubing for gas, water, or steam, and invite quotations from Canadian manufacturers. The firm are also buyers of iron and steel bars, joists, sheets, etc., wood screws, newsprint, ceiling boards (tongued and grooved), rough deal planks, as requisitions are received from abroad.

The Principle of Small House Design

There is not much danger in small house design that the exterior of the house will fail to indicate the nature of the structure. Nevertheless, truthfulness in design cannot be emphasized too strongly. In order to have a good design grow logically out of a sound plan, it is necessary to consider the various characteristics of the materials that are used. The practical, the sensible, and the convenient form the best possible foundation for good appearance. Pretentiousness is out of place in small house design. Features which are solely ornamental are unsuitable whenever the requirements are strictly utilitarian. To avoid extravagance, therefore every effort should be made to strengthen the principle of small house design. This principle is simplicity.

Canada's Contractors—Thos. Murphy

An important move in contracting circles is indicated in the announcement of the appointment of Mr. Thomas Murphy as vice-president and general manager of the Dufferin Construction Co., Ltd., 210 Victoria St., Toronto, Ont., a firm that have been very actively connected with road construction work throughout the province of Ontario for a number of years. Mr. Murphy comes to the company exceptionally well equipped through long experience to handle the type of work on which they specialize.. For seventeen years he has been connected with the roadway section of the department of works of the city of Toronto, his present position being superintendent of asphalt plants and paving. His connection with the civic service began in 1906 when he was an inspector. He then became the first day labor foreman on asphalt paving done by the city and when Toronto established its own asphalt plant was made superintendent, in addition to which he superintended all the asphalt paving in the city. All the track allowance paving by the Toronto Transportation Commission, for example, was handled under his jurisdiction. It is thus evident that in taking over his new work, Mr. Murphy brings with him an intimate knowledge of paving requirements and a ripe experience in the practical handling of highway construction problems. No doubt he will be a strong force in the already well-staffed organization of the Dufferin Construction Co. His appointment will become effective on November 15.

Mr. Thos. Murphy

Compensated for Cancellation of Contract

Mr. Justice Surveyer in the Quebec Superior Court handed down judgment on October 3 in the case of John Vaughn vs A. J. Mahon, condemning Mahon to pay the plaintiff $225,94, being the cost of excavation work done by the latter under a contract for the construction of a house in St. Lambert, P. Q. Vaughn agreed to build a house for Mahon to cost $4,175. When part of the excavation work was done, Mahon wrote Vaughn saying that the plans for the house were unsuitable, and that new plans had been drawn up. Before asking him to give estimates on the new construction, Mahon asked the contractor to consider the first contract null. Vaughn refused to consider the contract void and sued to recover damages.

Mr. Justice Surveyer pointed out that the Civil Code gives an owner the right to cancel a contract for the construction of a building, even when begun, upon indemnifying the workman for the actual expenses and labor incurred, and upon paying damages, if any are warranted by the circumstances of the case. Mr. Justice Surveyer, therefore gave judgment for the cost of the excavation, being $225.94, with interest from July 13, 1921.

Proper Handling of Lump Lime

Lime is one of the most useful building materials. Its uses are many, and in one form or another it enters into nearly every type of construction. The history of its development and manufacture is very interesting, and the details of many of the processes through which it passes are fascinating.

What actually takes place when lump lime is slaked? Many men who use lime have studied it carefully and know from experience just how to obtain the best results. There are others, however, who merely know lime as a substance, which, when water is added, slakes and forms a paste.

When quicklime, which is the product resulting from burning raw limestone, is placed in contact with water, they unite, and a chemical change takes place. Considerable heat is given off during this process and the proper regulation of this heat is necessary in order to obtain the best lime paste. Certain types of lime give off more heat than others, and these limes should be carefully watched to see that they do not "burn." Other limes are much slower slaking, and when working them care should be taken to see that too much water is not added, for they will "drown."

When using a quick-slaking lime, if insufficient water is added, the paste is not as plastic and works short. It feels slightly gritty, and has a yellowish tinge. The temperature of the mass is raised considerably above the boiling point, and a new chemical reaction takes place. This results in a formation of a substance which absorbs carbon dioxide at a rapid rate, and thus hardens before it may be used. Chemists have not been able to determine exactly what the new compound is, but the result is well known by many of those who use lime. In the case of "drowned" lime, however, the excess of water has absorbed too rapidly the heat required for slaking, and the change from the quicklime to the paste is retarded. When the paste is formed it is thin and watery and not satisfactory to use.

The man who slakes lump lime on the job has an important duty. He can produce an excellent material, smooth and fat, by taking pains to see that each batch is handled properly. Some of the larger contractors keep a man on their pay roll who has no other work than that of slaking lime and tending to the preparation of the mortar and plaster. He is an expert in his work, and is rated as such.

A good lime putty, properly prepared and allowed to age or soak for some time previous to its use, makes a mortar or plaster that is easy to apply. Ageing the paste imparts to it a degree of shoothness that cannot be otherwise obtained. The men who work with it are better satisfied and work more efficiently, and consequently obtain better results. Thus it is seen that the man with the hoe plays an important part in modern construction work.

Photographs Sell Construction Service

(Continued from page 1050)

photographs of completed structures, both exteriors and interiors, and from as many different viewpoints as are necessary to show every interesting detail about the job. Detail photographs of equipment installations are particularly desirable. An industrial power plant of small size, for example, should be treated just as thoroughly as a large plant, and the installation of all the principal units photographed. Such comparatively small details as shaft hangers, railings and interior partitions are well worth photographing. A novel construction method or detail also makes a desirable photograph. In all photographs for selling purposes the place should be cleaned up before the photograph is taken and the scene should be arranged as nearly as possible as it will be when the plant or building is in actual use. It is scarcely ever desirable to have men appear in the photograph, but when they do they should be required to attend strictly to business and not to appear as though they were having their pictures taken.

Toronto E. I. C.

On Thursday, November 8, the Toronto Branch of the Engineering Institute of Canada will be addressed by M. J. Butler, C.M.G., past president, E.I.C., on "A Proper Freight Rate for Coal"—an attempt to show a method of calculating a fair rate for the transportation of coal in train load lots from Alberta to Ontario points, with suggestions for suitable equipment to handle such traffic. The meeting will be held at 8.15 p.m. in Room 22, Mining Building, University of Toronto.

Sewer Pipe in Hamilton

By a vote of 28 to 3, the city council of Hamilton, Ont., on Oct. 30 accepted the bid of the Doolittle Russell Company, to supply concrete sewer pipe. For some time there has been some controversy as to whether this type of pipe or the vitrified clay product should be used.

Salvaging Old Brick Pavements

Finding often-times that old brick pavements in fair condition can be utilized as bases for new streets at a great saving in the cost of construction, highway engineers in many localities are adopting the policy of salvaging old brick pavements by surfacing with asphaltic concrete or sheet asphalt.

A. G. C. Will Meet in Chicago

The 1924 convention of the Associated General Contractors of America will be held in Chicago on January 21, 22, 23 and 24, 1924.

Mainly Constructional

East and West—From Coast to Coast

A recent report states that reference was made by Sir Adam Beck, while in Windsor recently, to a large gas and by-product plant which the Ontario Hydro-Electric Power Commission propose erecting in that city. The plant is to be ten times as large as that being built by the Ford Motor Company at Ford.

A recent report to the effect that the Canadian Baldwin Steel Co. are in the U. S. market for 50,000 to 60,000 tons of sheets would indicate that this company contemplate a resumption of operations at their plant in Toronto.

The provincial government is considering the question of a roadway for vehicular traffic across the Quebec bridge. The engineers who supervised the construction of the bridge are studying the plans of the structure to see whether the building of a roadway across the bridge is feasible, and will report to the provincial government.

Officials of the Building Trades Council at Toronto, appeared before the Board of Control recently to request that building programs of different civic departments be proceeded with immediately to avert unemployment, which would arise this winter. The deputation was informed that there would be a decision upon the viaduct by November 16, and was told that the city would join any deputation to the Federal Government to urge upon the Government the necessity of opening up public works.

Announcement has been made by the Dominion Government of a competition to be open to architects, sculptors and artists all over the world, for designs for a monument to be erected to the memory of the late Sir Wilfrid Laurier, at Parliament Hill, Ottawa. The memorial will be a full portrait statue of Sir Wilfrid Laurier, with head uncovered, and is not to exceed $25,000 in cost.

The completion by the Ontario Highway Commission of the asphalt surfacing of the Kingston road, through to Whitby and Oshawa, marks an important event in highway construction in the Province of Ontario, and an expenditure approximately of $5,000,000. It is proposed in Whitby to commemorate the completion of the work by a formal celebration, to which the representatives from the city and all the municipalities east will be invited.

The city council, at Winnipeg, recently decided to submit a by-law to the ratepayers at the forthcoming civic elections on November 26, for the establshment of an $875,000 central steam heating plant. The ratepayers will be asked to pass on a debenture issue of $550,000, and approve the scheme for co-ordinating a central steam heating plant with the hydro standby plant.

Hon. James Lyons, Minister of Lands & Forests, while addressing a luncheon meeting of the Canadian Club at Fort William recently, advocated the building of a highway from Sault Ste. Marie to Winnipeg. From Fort William to Winnipeg, he stated, the partly constructed road could be completed without great difficulty. The difficult portion would be from Port Arthur to the Soo. The Government hoped to have engineers at work shortly on a survey around the north shore of Lake Superior, where it is planned to develop one of the finest scenic highways in the world.

A recent report states that the Toronto Hospital for Incurables will be granted the sum of $125,000 by the Provincial Government towards the construction of an addition to their building on Dunn Avenue. The entire amount of $300,000 required for the financing of this addition has now been accounted for, the city having promised a grant of $125,000 when the province donated a like amount, and the board of management will assume responsibilty for the other $50,000.

Following up a rumor current some months ago, to the effect that the large artificial silk manufacturing concern of Courtalds, Ltd., London, England, proposed locating a branch manufacturing plant in Canada, word has been received from Montreal that this concern has purchased from the Sun Life Assurance Co. of Canada property on the banks of the St. Lawrence River, at Cornwall, Ont., known as the "French Farm," comprising 240 acres of land, for the location of their Canadian plant. Mr. C. R. Tetley, A.R.I.B.A., Montreal, is Canadian architect for the firm. He was in England this summer for the purpose of studying the firm's requirements in the way of manufacturing buildings.

A recent announcement from Ottawa is to the effect that tenders will be called within two week's time for the construction of section 8 of the Welland Canal. This will leave only sections 6 and 7 to be placed under contract. Section 8 will follow an alignment from Ramey's bend, in the present canal, to make a junction with the present canal a short distance west of the guard locks at Port Colborne, from where the channel will be deepened to a point in Lake Erie about 1,000 ft. outside the existing breakwater. The work on section 8 will consist of considerable rock excavation in the diversion, the construction of a guard lock near the eastern end of the section, and submarine rock excavation in the harbour of Port Colborne and in the entrance channel.

Personal

Mr. Horace L. Seymour, M.E.I.C. and member of the Town Planning Institute of Canada, has been appointed to the position of special lecturer in Town Planning in the Department of Civil Engineering, Faculty of Applied Science, University of Toronto.

Mr. John T. Hornsby, architect of Lindsay, Ont., recently took over the business of Mr. W. H. Barry, 332½ George St., Peterborough, Ont., and would like manufacturers' samples and catalogues.

Mr. G. N. Houston has opened a consulting engineering business at Lethbridge, Alta., his offices being located in the Oliver Block. Mr. Houston was formerly acting Commissioner of Irrigation for the Dominion and has had considerable experience in several branches of engineering during the past 25 years.

Mr. Cecil R. Scott of Toronto, has accepted an appointment with the large English contracting firm of Sir Wm. Arrol, Ltd., and will be located at Cochrane, Ont. Mr. Scott is a graduate of the University of Toronto in civil engineering.

Lord Byng officiated at the opening of the world's largest dry dock at St. John, N. B., on October 29.

Trade Incorporations

Lessard & Faucher, contractors, was a recent registration at Montreal.

Richard & Cyr, contractors, were registered recently at Montreal. The principals are Messrs. Auguste Richard and Amedee Cyr.

CONSTRUCTIONAL ACTIVITY

Period of October 31 to November 6, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

London, Ont.
The city council contemplate sewer extensions at a cost of $200,000. The engineer in charge is W. A. Near.

Oshawa, Ont.
Tenders are being received till Novemberber 7 by the Board of Water Commissioners, for furnishing of a direct connected pump and motor f.o.b. car Oshawa, Ont., for installation in the pump station. Capacity of pump required, 1,000 I.G.P.M.; 550 volt, 60 cycle, 3 h.p. squirrel cage induction motor. A marked cheque for $200.00 required.

Val Brilliant, Que.
The town council contemplate the erection of a $15,000 aqueduct. Work will start in summer.

York Twp., Ont.
Tenders are being received till November 12 by the engineer, F. B. Goodike, 40 Jarvis St., Toronto, for construction of approximately 6,000 lin. ft. of 12 in. vitrified sewer pipe together with construction of a reinforced concrete septic tank. Plans and specifications with engineers.

CONTRACTS AWARDED

Gloucester Twp., Ont.
Ottawa Gloucester Road Co., Ottawa, Ont., have the general contract for bituminous macadam road at $38,724.

Hamilton, Ont.
The city council has awarded the contract for sewer pipe to Doolittle-Russell Co., at $11,005,61.

Levis, Que.
The following contracts have been awarded in connection with gravelling roads on Levis-Sherbrooke Route; Wilfrid Cliche, St. Joseph-de-la Beauce, Que., at $9,840.49; Alphonse Roy, St. Frederick, Que., at $11,711.77.

March Twp., Ont.
Carleton County Council, Ottawa, have awarded the contract for bituminous macadam road, to Chas. O. Wood, Cameron St., Ottawa, at $32,912.

New Glasgow, N. S.
The town council has awarded the general contract for watermain on George St., to Spurgeon Gammon, at 80 cents lin. ft.

St. Roch L'Achigan, Que.
Joseph Vezina, St. Roch De L'Achigan, Que., has the general contract for gravelling road at $37,892,75.

Railroads, Bridges and Wharves

CONTRACTS AWARDED

Beach Point, P.E.I.
The general contract for building wharf has been awarded to Henry J. Phillips, 35 Grafton St., Charlottetown, at $8,400.

Port Au Persil, Que.
The contract for building wharf here has been awarded to Aristide Maltaise, La Malbaie, Que., at $10,248.

Port Renfrew, B. C.
Vancouver Pile Driving & Contracting Co. of Vancouver, have been awarded the general contract for reconstruction of wharf, at $7,984.

Renata, B. C.
The contract for public wharf at $7,298, has been awarded to D. C. Fraser and J. C. Webster, Nelson, B. C., and F. F. Lean, Trail, B. C.

St. Antoine De Tilly, Que.
T. Beaumont & J. Emile Collin, Montmagny, Que., have the contract for repairs and addition to wharf at $6,100.

St. Croix, Que.
T. Beaumont & J. Emile Collin, Montmagny, Que., have the general contract for repairs to wharf at $5,700.

Yamachiche, Que.
B. J. Trepanier, Three Rivers, Que., has the general contract for a concrete bridge $10,000. over Yamachiche river, The engineer is Ivan E. Vallee, Parliament Bldgs., Quebec.

Public Buildings, Churches and Schools

Berthier, Que.
J. A. Larue, 559 Durocher St., Montreal, is preparing plans of a church for Parish St. Michels Des Saints. Tenders will be called in December.

Cooksville, Ont.
Loyal Orange Lodge contemplate building a $6,000 lodge hall here. No material purchased. 2 storeys, brick construction.

Donnacona, Que.
Heliodore Laberg, 103 St. John St., Quebec, Que., is preparing plans for $30,000 addition to church for R. C. Parish.

Genesee, Alta.
Tenders will be received till November 12 by the secretary, C. Cropley, Genesee, Alta., for the construction of a frame school house.

Grimsby, Ont.
Board of Education contemplate building a High School here. Plans will be drawn in January and vote taken for bebentures.

Lundbreck, Alta.
Tenders will be received by the secretary-treasurer, A. W. Larmour, till November 15, for the erection of a frame school building. Plans and specifications with the secretary treasurer.

Point Grey B. C.
Tenders will be received till November 19 by the minister of public works, Hon. W. H. Sutherland, for the remodelling of former hospital annex into a home for incurables. Plans and specifications with Government agent, Vancouver, and Public Works Dept., Victoria, B. C.

Sherbrooke, Que.
Sherbrooke Arena Co., contemplate building a $30,000 skating rink here.

Saskatoon, Sask.
Tenders are being received till November 10, by the Dept. of Public Works, through the deputy minister, J. M. Smith, for the erection of a $400,000 tuberculosis sanitarium. Plans and specifications with the architect, M. W. Sharon, Parliament Bldgs., Regina, Sask.

Varennes, Que.
Raoul Gariepy, 15 St. James St., Montreal, is preparing plans for addition to convent owned by Soeurs Ste. Croix. Tenders will be called in two weeks.

Vancouver, B. C.
Tenders will be received till November 10 by the architect, R. T. Perry, 405 London Building, Vancouver, for the erection of $16,000 gymnasium and sunday school for Fairview Methodist Church.

Victoria, B. C.
Tenders will be received till November 15, by the architect, C. Elwood Watkins, Green Block, Victoria, for the erection of $125,000 high school for Oak Bay Board.

Ville Lasalle, Que.
Cardinal & Beauchamp, 26 St. James St., Montreal, are preparing plans of $50,000 school for R. C. School Commission. Tenders will be called shortly.

CONTRACTS AWARDED

Alexandria, Ont.
The general contract for erection of a public building here, has been awarded to Ross Meagher Co., Ottawa, Ont., at $31,979.

Banff, Alta.
Campbell & Hillier, Calgary, Alta., have the contract for plumbing, heating and sheet metal work in connection with $38,000 school being built here.

Caledonia, Ont.
W. W. Petley & Co., Toronto, have the general contract for high school to be built on south bank of Grand River. Plumbing and heating—Thos. Forster, 1426 Danforth Ave., Toronto. Architects, Walker & Gibson, 82 King E., Toronto. Steel, roofing, electric, plastering and painting to be let by general contractors.

Claremont, Ont.
M. A. Farelly, 600 Coxwell Ave., has the contract for plastering on $35,000 church being built. General contractors are W. W. Petley & Co. Architects,

Walker & Gibson, all of Toronto. Painting to be let.

East St. John, N. B.
Feene & Frechett, St. John, N. B., are preparing plans of church for the R. C. Church of St. John. Contract for excavation and foundations has been awarded to John Flood & Co., St. John.

Egmont Bay, P.E.I.
Thos. Johnston Co., Ltd., Summerside, P.E.I., have the contract for heating of $30,000 church being built for the R. C. Parish. Painting and glazing being done by general contractors, P. A. Rice & Co., Cardigan, P.E.I. Architects, Chappell & Hunter, Charlottetown.

Giffard, Que.
The following sub-trades have been let on $39,000 school. masonry and. carpentry—Philippe Mathieu; electric, plumbing and heating—Fortunate Gingras. roofing—Eugene Falardeau; painting—J. Tradivel. Architects are Bergeron & Lemay, Quebec, Que.

Giffard Village, Que.
The following sub-trades have been let on $55,000 boarding school being built for Rev. Sisters Oblates; masonry and carpentry—Emile Frenette; electric, plumbing and heating—J. Careau; roofing—Eugene Falardeau; painting—J. Tardivel.

Lethbridge, Alta.
J. H. Beatty, Dominion Block, Lethbridge, has the general contract for $9,000 masonic hall for Chinese Masonic Hall Co. Architects, Whiddington & Fry, Lethbridge, Alta.

Lazaretto, B. C.
Eli Hume, Victoria, B. C., has the general contract for huts and buildings to be built at Lazaretto, Bentinck Island, B. C., at a cost of $14,000.

Montreal, Que.
E. Lepage, 990 Parthenais, has the contract for marble and tiling for $40,000 presbytery being built for Parish of St. Jeanne D'Arc. Architects, Viau & Venne. General contractor, N. Beauchamp, 1559 Bordeaux.

Mount Royal, Que.
The general contract for $12,000 church hall for Church of England, has been let to Bremner Norris & Co., Masonry, plumbing, heating, plastering, painting and glazing to be let by general contractor. Millwork, roofing and electric to be let.

Point Grey, B. C.
E. J. Ryan Contracting Co., Ltd., Vancouver, have the general contract for $460,000 library to be built for University of B. C. Architects, Sharp & Thompson, Vancouver.

The walls are going up for $750,000 science building for University of B.C. The following sub-trades have been let; ventilating and heating—Barr & Anderson; plumbing—Murray Bros. Architects, Sharp & Thompson. General contractors, E. J. Ryan Contracting Co. All of Vancouver.

Port Arthur, Ont.
The following sub-trades have been let on $175,000 court house; heating—H. R. Sime, Port Arthur; plumbing—Purdy & Mansell, Ltd., Toronto. General contractor, J. McDiarmid Co., Ltd., Winnipeg, Man.

Quebec, Que.
The electric, plumbing and heating contract for medicine school being built for Seminary of Quebec, has been let to Jobin & Paquet, 94 Abraham Hill. Architects, Bergeron & Lemay, 145 St. John St., Quebec.

The general contract for heating system for "St Malo" school, has been awarded to Fortunate Gingras, 34 St. Augustin St. Architects, Tanguay & Chenevert, 20 D'Aiguillon St.

St. Lambert, Que.
The town council has awarded the general contract for $34,350 fire and police station to Duranceau & Duranceau, Montreal. General contractor wants prices on 15,000 Scoria blocks, crushed stone and sand. Millwork, roofing, plastering, painting and blazing to be let. Excavating, masonry and carpentry by general contractors.

Truro, N. S.
F. Dexter & Co.,594 Prince St., have the contract for plumbing and heating for $9,000 rectory being built for St. John's Anglican church. E. D. Vernon, is the architect. Electric, plastering, painting and glazing is being done by Frank C. McCurdy, 102 Willow St., general contractor.

Toronto, Ont.
Excavating work is being done for $54,000 sunday school and church for Ossington Ave. Baptist Church. Following sub-trades have been let; sheet metal—A. Matthews, Ltd.; masonry—H. N. Dancy & Son, Ltd.; steel—McGregor & McIntyre, Ltd.; carpentry—Smith & McElroy; plastering—A. Petrie, 457 Roxton Rd.; painting—Brankston & Son, Ltd. Architects are Shepard & Calvin.

The Board of Education has awarded the following contracts for school work; science tables $12,531—N. S. Houghton, 99 King W.; iron fencing $1,539—Shipway Iron & Wire Mfg. Co., 700 Wellington W.

Victoriaville, Que.
Levasseur & Levasseur have the general contract for $50,000 college being built here for Brothers of Holy Heart. Sub-trades to be let.

Vancouver, B. C.
Excavation work is being done for $32,000 Infants Dormitory for Children's Aid Society. Plastering—Geo. Rush Plastering Co.; plumbing and heating—Barr & Anderson, 1060 Homer St., at $4,423. Architects, Sharp & Thompson. 708 London Bldg., Vancouver. General contractors, Hodgson, King & Marble.

Waterville, N. S.
J. H. Hicks & Son, Bridgetown, N. S., have the general contract for $12,000 church for Methodist & Presbyterian Union, and will let roofing, plumbing, electric, wiring, plastering and painting trades.

Wolfville, N. S.
The plumbing and heating contract for $350,000 auditorium and lecture rooms for Arcadia University, has been awarded to H. G. Hagen & Co., Halifax. N. S. Painting and glazing by general contractors, Rhodes, Curry Co., Ltd., Amherst, N. S. Architect, L. R. Fairn, Aylesford, N. S. Roofing, sheet metal, electric and plastering trades to be let.

Business Buildings and Industrial Plants

Amherstburg, Ont.
A. A. Isenhour contemplates building a glass factory here, and is interested in prices of special equipment for manufacture of glass.

Edmonton, Alta.
Work is to start shortly on a dairy and warehouse for the Edmonton City Dairy Limited, Edmonton.

Halifax, N. S.
McDonald Engineering Co., Ltd., C. P.R. Building, Toronto, Ont., are submitting a tender for the construction of the Government elevator and want tenders on sub-trades.

Listowel, Ont.
Work is in progress for $125,000 addition to knitting mills of Perfect Knit Mills, Ltd. This company want prices at once on iron piping for heating and sprinkler work; also electric material for light and power wiring.

London, Ont.
John M. Moore 489 Richmond St., is preparing plans for $200,000 Y.W.C.A. building.

Montreal, Que.
Work is to start shortly on $15,000 residence and dairy corner De La Roche and Beaubien, for L. P. Beauchemin, 2063 St. Hubert, owner and builder.

Rosthern, Sask.
J. M. Morrison, Saskatoon, Sask., is preparing plans for $10,000 office and warehouse Geo. Braden, Rosthern, is the owner.

St. Catharines, Ont.
Bulk or separate tenders are being received till November 12 by the architects, Nicholson & MacBeth, 46 Queen St., in connection with $25,000 factory to be built for Northern Silk Mills Co. Plans and specifications with architects, and MacLean Building Reports Ltd., 345 Adelaide St. W., Toronto. Ont.

Sarnia, Ont.
The Dominion Alloy Steel Corporation will start work at once on the erection of their three million dollar plant at Sarnia. This is the announcement ot the directors following the subscribtion for a million dollars of the stock by residents of the Sarnia district. It is said the other two millions have been underwritten by a U.S. firm.

Toronto, Ont.
Excavating work is being done for $45,000 factory north west corner Jarvis and Lombard Sts., owned by Geo. Sheppard, 42 Colborne St. Architect and engineer, Ashley, Woodburn, 89 Willow Ave. Elevator, electric, heating and plumbing to be let by owner.

Work is in progress for alterations to store at 185 Yonge St. N. A. Armstrong Co., Ltd., 7 King East. are the architects, and want prices at once on rubber tile flooring.

Walsh Electric Co., 465 Church St. have purchased a site at 255 Church St. for manufacturing purposes. Present building on site will be wrecked and a 4 or 5 storey building will be erected next spring.

Thousand Island Beach, Ont.
E. G. Bird, 6 King St. W., Toronto,

is preparing plans for $200,000 summer hotel to be owned by the Royal St. Lawrence Hotel Co., Ltd. Tenders for the foundation work may be called about November 15.

Walkerville, Ont.
Henry Ford is reported as stating that he will spend ten million dollars in plant in Canada during 1924.

Canadian Bridge Co. are the owners and general contractors of $8,000 addition to galvanizing plant. Roofing, electric, heating, and plumbing to be let.

Winnipeg, Man.
J. N. Semmens, Great West Permanent Loan Bldg., Winnipeg, is preparing plans for an addition to bakers of Canada Bread Co., Ltd., Winnipeg.

CONTRACTS AWARDED

Brantford, Ont.
Turnbull & Sutcliffe, 50 Colborne St., Brantford, have the contract for heating in connection with $15,000 Warehouse, office and garage for British American Oil Co., Ltd. Consulting engineer, W. A. T. Schorman; general contractors, P. H. Secord & Sons Construction Co.

Cap De La Madeleine, Que.
Geo. St. Pierre, St. Thomas St., has the contract for painting of $8,000 garage being built on Notre Dame St. for Pierre Dumas, Notre Dame St. U. W. Rousseau is the general contractor.

Dundas, Ont.
F. G. Haskings & Co., Dundas, Ont., are the architects and general contractors of factory and office building on Main St., for the Kaustine Co. Ltd.

Lunenburg, N. S.
The following sub-trades have been let on $25,000 Masonic Temple; ventilating—Frank Powers, Lunenburg; electric—Arthur & Conn, Ltd., Halifax. Plastering, painting and glazing being done by general contractors, Russell & Macaulay, Halifax. Architect, S. P. Dumaresq, Halifax.

Montreal, Que.
Dominion Bridge Co., Ltd., Lachine, Que., have the general contract for repairs to arena on Mt. Royal Ave., costing $7,240. Millwork day labor by owners, Arena Amusement, Ltd.

Mimico, Ont.
Sub-trades as follows have been let on $20,000 branch of Bank of Montreal; painting—Brankston & Son, Ltd.; masonry and carpentry— C. W. Wood & Sons; electric—Harry Alexander, Ltd.; plastering—John Nelson & Son; all of Toronto. Roofing, sheet metal, plumbing and heating—J. H. Doughty, Mimico.

Ottawa, Ont.
W. J. Carson, Laurier Ave. W., has the contract for painting on $60,000 addition to store on O'Connor St. for L. N. Poulin, Ltd., Sparks St. Alex. Gravock, corner Sparks and Bank Sts., has the general contract. Architect, J. A. Ewart, Bank St.

Port Colborne, Ont.
Wilmer Neff, Humberstone, has the general contract for $18,000 business block on Charlotte St., owned by Port Colborne Supply Co., Ltd. Masonry—Peter Beam. General contractor buys lumber, glass and hardware.

Quebec, Que.
L. H. Peters Ltd., 10 St. Angele St., have the general contract for $9,500 shed and warehouse for W. Thomas Ltd., 98 Dalhousie St.

Ridgeway, Ont.
W. E. Wilkinson, Bridgeburg, Ont., has the contract for plumbing and heating for $67,000 club house and not E. Cardwell, Welland, Ont., as previously reported.

Toronto, Ont.
Geo. L. Robinson, 107 Armstrong Ave. has the contract for structural steel, masonry and reinforced concrete work in connection with the rebuilding of club house for Parkdale Canoe Club, Sunnyside, Architects, Molesworth, West & Secord.

Steelwork is going up for $175,000 office building corner Gerrard and Yonge Sts. for Canada Life Assurance Co. Painting and glazing—F.G. Roberts & Co., Ltd.; marble and tile work—Geo. Oakley & Son, Ltd.; roofing and sheet metal—A. B. Ormsby Co., Ltd., The general contractors are P. H. Secord & Sons Construction Co., Ltd. Architects, Sproatt & Rolph.

The walls are going up for dye house and manufacturing building for Toronto Carpet Mfg. Co. H. Williams & Co., have the contract for roofing. Painting and plastering to be let. Architect, Wm. Steel & Son, Ryrie Bldg.

H. A. Wickett & Co., Ltd., 127 Front East, have the general contract for new roof at 10 Adelaide East, owned by Canadian Mortgage Investment Co. The cost will be $12,000.

Windsor, Ont.
The walls are going up for $7,000 garage on Church St., for E. P. Holden, 566 Bruce Ave. Ed. Wells, 530 Bruce Ave., has the general contract. Plumbing—Chas. W. Jessop, 619 London St. W. Electric, painting and carpentry to be let.

Residences

Edmonton, Alta.
Imperial Lumber Co., 829 Tegler Bldg., Edmonton, Alta., are interested in prices for excavation, concrete and brickwork for $5,000 residence to be built on 118th St. 1 storey, 28 x 44, brick construction.

Halifax, N. S.
Excavation work is being done for $8,000 residence corner Jubilee Rd. and Beech St., for Alan T. MacDonald, 9 Rosebank Ave. Work day labor by owner.

Hamilton, Ont.
Witt, Bull & Oxford, 124 Edgemont Ave., contemplate building 2 residences on Frederick Ave. Roofing, plastering, painting, electric, heating and plumbing to be let.

Kitchener, Ont.
Foundations are in for $10,000 residence corner Maynard and Margaret Aves. Bacher & Hanch, 37 Queen St. S., are the owners and general contractors. Tenders are being received on heating, plumbing, plastering, electric and painting.

Montreal, Que.
M. Bernstein, 591 St. Catherine W., is the owner and builder of $16,000 residence on Grand Blvd., between Sherbrooke and C.P.R. Masonry, marble, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let. Carpentry by day labor.

The foundations are going in for $45,000 residence on Sherbrooke, between Grey and Vendome. N. Shribman, 5056 Sherbrooke W., is the owner and builder. All sub-trades to be let.

J. B. Lavoie, 303a Delanaudiere, is the owner and builder of $9,000 residence on Addington, near Cote Ste. Antoine. All sub-trades to be let.

E. Lasonde, 2263 Descarrieres, is the owner of $8,000 residence on Laurier, corner Rivard. Roofing, electric, plumbing, heating, plastering and painting trades to be let.

O. Belanger, 1852 Denormanville St., is the owner of $8,000 residence being built on Denormanville, near Bellechasse. Roofing, electric, plumbing, plastering and painting to be let.

E. Gregoire, 418 Plessis, is the owner and builder of $8,000 residence on Wurtelle, between Hochelaga and Rouen. Sub-trades to be let.

A. Letourneaux, 2554 Wilson, is the owner and builder of $15,000 residence on Sherbrooke, near Melrose. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Excavation work is being done for $12,000 residence on Laurier Ave., between Garnier and Delanaudiere. T. Pilotte, 2050 Chabot St., is the owner and builder, and will let sub-trades. Carpentry by day labor.

J. S. Brown, 324 Patricia, is the owner and builder of 4 residences, $35,000, on Patricia, between Terrebonne and Somerled. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

W. Beaudoin, 2430 Esplanade, is the owner and builder of $12,000 residence on St. Joseph Blvd., between St. Denis and De Grandpre. Brickwork, millwork, electric, plumbing, plastering, heating, painting and glazing to be let.

Outremont, Que.
R. Charbonneau, 194 G. E. Cartier Sq., is preparing plans for 2 cottages, $8,500 each, for A. Loyer, care architect.

Ottawa, Ont.
Eastman & Jeffrey, 111 Belmont Ave., are the owners and general contractors of $7,500 residence on Fentiman Ave. Tenders are being received for plastering, heating, plumbing, and electric trades.

C. H. Stata, 209 Pretoria Ave., is the owner and builder of $7,000 residence on Grove Ave. No material purchased. 9,000 bricks and material for 30 cu. yds. concrete and 800 cu. yds. plaster required.

Rostetter & Taylor, 39 Belmont Ave., contemplate building a $6,000 residence on South St.

The walls are going up for $6,000 residence on Grove Ave. Tenders are being received till November 8, by the owner and general contractor, D. Younghusband, 322 Cooper St., on electric, heating, plumbing and plastering.

The excavation work is to start shortly for 2 residences, $6,000 each, on Brighton Ave. Taylor & Rostetter, 89 Belmont Ave., are the owners and builders. 12,000 brick and material for 30 cu. yds. of concrete and 800 sq. yds. of plaster required.

Caleb Brookes, 590 Driveway, is the owner and general contractor of $6,000 residence on Flora St. No material purchased. 9,000 bricks and material for 26 cu. yds. concrete and 800 sq. yds. plaster required.

J. P. McDonald, 229 Gloucester St., is the owner and general contractor of $11,000 residence to be built on Powell Ave. No material purchased. 14,000 brick and material for 36 cu. yds. concrete and 900 cu. yds. plaster required.

The foundations are going in for $14,000 apartment house on Butternut Ave. J. Couillard, 82 Putnam Ave., is the owner and general contractor. Tenders are being received by owner for heating, plumbing, plastering, painting and electric trades.

Caleb Brookes, 590 Driveway, is the owner and general contractor of 2 residences, $10,000, to be built on Bronson Ave. No material purchased. 18,000 bricks and material for 65 cu. yds. concrete and 1600 sq. yds. plaster required.

Regina, Sask.

Geo. Broder, 939 Victoria Ave., is the owner and builder of 2 residences, $3,000 each, on Stuart St.

St. Laurent, Que.

The walls are going up for 2 dwellings, $7,000, on College St. E. Robitaille, 146 College St., is the owner and builder. Roofing, plumbing and heating to be let.

Toronto, Ont.

N. A. Armstrong Co. Ltd., 7 King E., are preparing plans of $8,000 residence on Humberside Rd., for Dr. A. Semple, 941 College St.

Jno. M. Bentley, 517 Runnymede Rd., is the owner and builder of 1 pair residences south side McGregor Ave., near Runnymede Rd., and employs regular staff.

The foundations are in for 1 pair residences, $4,000 each, south side McGregor Ave., near Runnymede Rd. J. Usprich, 160 Maria St., is the owner and builder. Painting, plastering, heating, electric and plumbing to be let.

The walls are going up for 2 residences, $8,000 each, east side May St., near Weatherall Ave. Jno. A. Houden, 236 Humberside Ave., is the owner and builder. Tenders are being received on plastering, painting, electric, plumbing and heating.

R. Crocker, 21 Humber Blvd., Mt. Dennis, is the owner and builder of 2 residences, $4,000 each, west side Asquith Ave., near Weston Rd.

Independent Builders, Ltd., 278 Dundas West, are the owners of residence being built north side Millwood Rd., near Mt. Pleasant Rd. Tenders are being received on plastering, electric, heating, painting and plumbing.

A. Clark & Son, 224 Augusta Ave., are the owners and builders of 5 residences and garages, $12-15,000 each, on Austin Terrace. Plastering, electric and painting still to be let.

H. F. Layburn, 23 Classic Ave., is the owner and builder of $10,000 residence east side Kendal Ave., near Burton Rd. Tenders are being received on painting, electric, plastering, plumbing and heating.

Excavation work is being done for $12,000 residence north side Inglewood Drive, near McLennan Ave., for A. P. Whealy, care architects, J. Hunt Stanford & Son, 67 Yonge Arcade. General contractor is C. A. Scott, 22 Stanhope Ave., who supervises the work and will let all smaller trades.

Foundations are going in for 2 bungalows, $6,500 each, east side Glendonwynne, near Quebec. Herbert C. Fisher, 71 Armadale Ave., is the owner and builder, and is receiving tenders on plastering, electric, heating, painting and plumbing.

The walls are going up for 1 pair residences, $4,500 each, east side Alberta Ave., near Tyrell Ave. W. Brown, 152 Tyrell Ave., is the owner and builder. Masonry day labor. Tenders are being received on plastering, painting, electric, plumbing and heating.

The foundations are going in for 1 pair residences, $4,500 each, at 118-20 Earlscourt Ave. Kitchen & Ansley, 1285 Danforth Ave., are the owners and builders. Tenders are being received on plastering, painting, electric, plumbing and heating.

The foundations are going in for 1 pair residences, $6,500 each, west side Runnymede Rd., near Colbeck Ave. Chas. C. Allen, 29a Callender Ave., is the owner and builder, and is receiving tenders on painting, heating, plastering, plumbing and electric. Masonry by day labor.

The footings are going in for 1 single and 1 pair residences, $9,000, north side Soudan Ave. and Brownlow Ave. Robt. Luxton, 583 Pape Ave., is the owner and builder and will let the plumbing, plastering, heating, electric and painting trades.

Excavating work is being done for 2 residences east side Roach Ave., near Valley Rd. H. H. Talbot, 48 Gillespie Ave., is the owner and builder. Painting, heating, plastering, plumbing and electric to be let.

Excavating work is being done for 2 residences, $5,500 each, east side Winnett Ave., near Vaughan Rd. H. Craven, 50 Sproatt Ave., is the owner and builder. Tenders are being received on painting, electric, plastering plumbing and heating.

The foundations are going in for 3 residences, $6,000 each, on Cloverdale Ave., near St. Clair West. Independent Builders, Ltd., 2782 Dundas West, are the owners and builders. Tenders are being received on plastering, electric, plumbing, hot air heating, and painting

Foundations are going in for 2 residences, $5,000 each, south side Craighurst Ave., near Rosewell Ave. Painting, electric, plastering, plumbing and heating to be let by the owner and builder, Wm. Rayfield, 495 Sherbourne St Masonry, day labor.

Work is to start shortly on 2 pair residences, $10,000, south side Swanwick, near Pickering Ave. C. B. Routcliffe, 11 Roseheath Ave., is the owner and builder. Plastering, electric, plumbing, painting and heating to be let.

Tenders have been received in connection with $126,000 apartment house to be built south west corner Homewood Ave. and Wellesley Cres. Kaplan & Sprachman, 298 Dundas West, are the architects, and want prices and catalogues at once on rolling wood partitions.

The walls are going up for 2 residences, $4,500 each, at 33-35 Brookside Ave. Painting, electric, plastering, plumbing and heating to be let by the owner and builder. Wm. Ballantyne, 690 Gladstone Ave. Masonry by day labor.

J. W. Siddall, 137 Alcorn Ave., is preparing plans for 10 residences to be built in Woodmount Ave. vicinity. W. N. McEachren & Sons, Ltd., 1801 Danforth Ave., are the owners and builders. Foundations expected to be put in this fall.

Excavation work is to start at once for 7 residences, $4,300 each, west side Hemlock Ave. Fred Lankin, 223 Fulton Ave., is the owner and builder. Plastering, electric, plumbing, painting and heating trades to be let. No material purchased.

Verdun, Que.

A. Leduc, 283 Regina, is the owner of $10,000 residence being built on Regina St.

CONTRACTS AWARDED

Ancaster Twp., Ont.

The foundations are going in for $11,000 residence being built for M. L. McBeath, 31 Park St. N., Hamilton. F. G. Haskins & Co. have the general contract.

Bowmanville, Ont.

H. L. Quinn has the general contract for $7,000 residence on Scogog St. for Walter Lyon. Masonry, painting, heating, plastering, plumbing and electric trades to be let.

Dorval, Que.

Church Ross Co., Ltd., 10 Cathcart St., have the general contract for $25,000 addition to residence of J. W. McConnell; marble and tiling—Smith Marble & Construction Co.; millwork—Traversey Ltd.. roofing—Geo. W. Reed & Co.; plumbing and heating—John Gordon; plastering—F. Charles; painting and glazing. Masonry by general contractor. Architect, K. G. Rea, 285 Beaver Hall Hill, Montreal.

Ford. Ont.

Walter E. Middleton, 58 Windermere Rd., Walkerville, has the contract for plastering of $15,000 residence on Sandwich St. Electric and painting to be let. Joe L. Reaume is the owner and general contractor. Architect. Irwin Walker, Manning Block, Windsor, Ont.

Ford City Plumbing & Heating Co. have the contract for plumbing and heating of $15,000 residence being built on Sandwich St. Joe L. Reaume is the owner and general contractor. Architect, Irwin Walker, Windsor. Electric, plastering and painting to be let.

Gaspe, Que.

J. H. Paquet, 30 Dalhousie St., Quebec, has the contract for electric and plumbing for $30,000 addition to bishop's residence.

Montreal, Que.

Purdy & Henderson Co., Ltd., have

the general contract for repairs to residence at 443 University Ave., to cost $25,000, for Parish of Christ Church. Architects, Ross & MacDonald, 1 Belmont St.

The foundations are going in for $125,000 apartment house on St. Catherine E., between Vemont and limits, for A. Leclair, 120 Leclaire, owner and builder. J. P. Abel Fortin Ltd., 383 Desjardins, have the contract for millwork. Other sub-trades to be let.

The general contract for building 5 flats corner Belanger and Drolet, has been awarded to E. J. Moran & Co., 166 St. Andre St. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let. Architects, Bastien & Cartier, 76 St. James St. Owner, C. Courey, care architects.

Lessard & Faucher, 366 St. Christophe, have the general contract for 18 dwellings, $28,000, on St. Denis St. G. N. Clermont, 1160 St. Denis, is the owner. Architect, Raoul Gariepy, 15 St. James St. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

J. Labelle, 3528 Christophe Colomb, has the general contract for 2 residences, $15,000, on St. Valier, between Belanger and Isabeau, for E. Leonard, 3035 Christophe Colomb. Roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

H. Beloff, 52 Duluth Ave., has the contract for roofing, and H. Daniels, 139 Julford St., the contract for painting and glazing, of $15,000 residence on Mance, between Bernard and St. Viateur. J. Gillet & Co., 1188 City Hall, are the owners and builders.

Oakville, Ont.

Sub-trades as follows have been let on $11,000 residence being built on First St. for E. Dean Wilkes; electric—J. A. Sullivan; plumbing and heating — W. Whitaker, Jr.; plastering — A. Ross. Thos. Shields is the general contractor.

Ottawa, Ont.

Tenders are being received by the general contractor, Geo. A. Eaman Co., Ltd., 102 First Ave., for plastering, heating, plumbing and electric trades on $9,000 residence being built on Clemow Ave., for J. R. Howie, care general contractor.

The walls are going up for $10,000 duplex residence on McLeod St., for C. Armstrong, care general contractors, Capital Contractors, Ltd., 233 Jackson Bldg.; electric—Marchand Electric Co.; heating and plumbing—E. Monette; plastering — N. Normand; painting — J. B. Duford.

Port Credit, Ont.

The following sub-trades have been let on $30,000 store and residence being built corner Toronto and Anne Sts., for Mr. Skinner, Schomberg, Ont.; electric —Harris & Marson, Toronto; heating and plumbing—J. McMahon, Port Credit; plastering—H. Campbell, care general contractors, Duro Construction Co., Port Credit.

Point Grey, B. C.

H. Burnham, 1545 Fifth Ave. E., Vancouver, is the architect and general contractor of $6,800 residence at 1147—38th Ave., for C. C. Falconer, 216 Duncan Bldg., Vancouver. No materials purchased. No sub-trades let.

Quebec, Que.

L. H. Gaudry & Cie., 25 Sault au Matelot St., have the general contract for 8 residences, $10,000 each, to be built on Battlefields Park for Evariste Rochette, 10 Turnbull Ave. Architect, Heliodore Laberge, 103 St. John St.

Sydney, N. S.

Sub-trades as follows have been let on $6,000 residence being built on St. Peters Road for D. W. Nichol, 199 Whitney Ave.; plumbing and heating—Hagen & Co. Sydney Ltd.; plastering—Jos. Buffett, North Sydney; painting and glazing —O'Callaghan & McKenzie; electric— Campbell & Desmond.

St. Catharines, Ont.

The following sub-trades have been let on $6,000 residence being built at 55 Ontario St. S.; sheet metal, heating and plumbing — Bowman Bros.; electric—H. C. Holmes; plastering—Dakers & Swan; painting—F. Wright. All of St. Catharines.

Truro, N. S.

Howard Hayman, 167 Pleasant St., has the general contract for $5,000 residence on Duke St. for F. W. Armstrong; electric—H. W. Raguse; plumbing—F. Dexter & Co.; heating—C. F. Fox & Co.; plastering—Wm. Burgess; painting and glazing to be let by general contractor.

Three Rivers, Que.

The following sub-trades have been let on $10,000 tenement being built on St. Francois Xavier St.; carpentry— Donat Blanchette, 331 Notre Dame St.; masonry—Cossett & Gauthier, 658 St. Francois Xavier. H. R. Winkenden, 97 St. Francois Xavier is the owner and builder.

Valere Garceau, 238 Ste Julie, has the contract for plastering of $12,000 bungalow on Notre Dame St., for Robert F. Grant, manager, St. Maurice Lumber Co., Three Rivers. Architects, Asselin & Denoncourt, 42 Alexandre St.

Toronto, Ont.

Harry W. Rushby, 219 Wychwood Ave., has the contract for plumbing, and W. C. Weeks, 4 Bird Ave., contract for heating, in connection with 3 detached bungalows, $16,500, on north side Wanless Ave. John R. Marshall, 179 Oakwood Ave., is the owner and builder. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade. Plastering and painting by day labor.

The following sub-trades have been let on 2 pair residences, $8,000 pair, at 12-18 Hunter Ave.; electric—Nichol & Fagan; plumbing—H. J. Derrick, 47 Woolfrey Ave.; heating—Parker & Ryan; plastering—W. Tattersall, 27 Mountalan Ave.; painting—F. E. Taylor, 1824 Gerrard East. L. J. Lummis, 11 Albermarle Ave., is the owner and builder

The following sub-trades have been let on 2 residences, $20,000, and 2 pair residences, $27,000, east side Springmount, near Regal Road, being built for Geo. B. Patton, 36 Regal Road; building—W. E. Tweedy, 107 Harbord St.; masonry—T. Roden, 51 Goodwood Ave.; plastering, heating, electric and plumbing to be let. Painting by owner. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade.

The walls are going up for $15,000 residence north side Mountjoy Ave. W. Luxton, 583 Pape Ave. is the owner and builder. Masonry—Art Hindle, 98 Strathcona Ave.; plumbing—W. Watson, 10 Blong Ave. Plastering, electric, painting and heating trades to be let by owner.

The following sub-trades have been let on 1 pair residences $7,000 each, at 58-60 Lappin Ave.; electric—Thos. Jackson, 11 Sorauren Ave.; plumbing—Jas. Downing, Jr. 68 Lappin Ave.; plastering—Geo. Rushton, 56 Dovercourt Rd.. heating— Geo. Davis, 37 Boon Ave. Painting by owner, Jas Dowling, 62 Lappin Ave.

J. Knighton, 120 Wiltshire Ave., has the contract for masonry for 1 pair residences, $8,000, north west corner Boultbee and Condor Ave. Thos. Fairburn, 15 Baird Ave., is the owner and builder, and is receiving tenders on plastering, painting, heating, plumbing and electric trades.

N. J. Wise, 262 Perth Ave., has the contract for carpentry and interior trim, and Belyea Bros., 1375 Bathurst St., the contract for heating and plumbing for $9,500 residence and garage being built west side Lauder Ave., near Cloverland, for Mrs. A. Foster, 986a St. Clair W.

J. Ritchie, 851 Logan Ave., has the plumbing contract, and R. M. Leslie, 10 Bungalow Rd., Rivercourt, the heating contract for $9,000 store and apartments at 126 Danforth Ave., for Wm. E. Playter, 28 Playter Cres. Alex. Grant, 837 Logan Ave., has the general contract.

The following sub-trades have been let on 3 stores and apartments north side Danforth, near Caithness Ave.; plumbing—R. Reading, 14 Arundel Ave.; heating—R. M. Leslie, 10 Bungalow Rd., Rivercourt. S. H. Lumb, 31 Oakdene Cres., is the owner and builder.

Verdun, Que.

Duranceau & Duranceau have the contract for masonry work, and O. Aubertin & Co. the contract for plastering, for 3 residences, $7,000, being built on Third Ave., for P. Lalonde, 465 Lasalle Rd.

Waterloo, Ont.

Reitzel Bros., Allen St., have the general contract for $6,000 residence on Simeon St., for J. Hessenauer, Queen St. S. Tenders are being received by the owner on heating and plumbing.

Windsor, Ont.

Ray Perry, Bridge Ave., has the electrical contract on $8,000 duplex residence on Elsemere Ave. W. R. Phillips, 157 Crawford Ave. is the owner and general contractor. Painting and plastering to be let.

Power Plants, Electricity and Telephones

Colchester South Twp., Ont.

The Citizens Committee are negotiating for an extension of hydro lines from Harrow to Lake Front properties.

Wiarton, Ont.

The town council contemplate remodelling electric lighting system and will ask Hydro Commission to provide estimates for converting present system

(Continued on page 57)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Department of Trade and Commerce,
Ottawa, Ontario

GRAIN ELEVATOR AND CONVEYOR GALLERIES AT HALIFAX, N.S.

Notice to Contractors

Department has extended date for receipt of tenders for Halifax Elevator until noon,

Thursday, November 15th, 1923,

By Order,
F. C. T. O'HARA,
Deputy Minister.

Department of Trade and Commerce,
Ottawa, November 2nd, 1923. 45

Tender for Repairs to Tug Hercules and Steel Hopper Scows

Nos. 14 and 15

Separate sealed tenders, addressed to the undersigned and endorsed "Tender for repairs to Tug Hercules and Steel Hopper Scows Nos. 14 and 15" will be received at this office until 12 o'clock noon,

Tuesday, November 13, 1923,

for towing, docking, repairs, renewals and painting tug Hercules and Steel Hopper Scows Nos. 14 and 15.

Tenders will not be considered unless made on the forms supplied by Department and according to conditions set forth therein.

Intending tenderers may view and ascertain the extent of the work by visiting the tug and scows, which are now attending Dredge P.W.D. No. 109, in Goderich Harbour, Ont., and by appyling to the Assistant Master of the Dredge, H. J. Fox, on board the dredge.

Copies of specification can be obtained at this Department and can be seen at the office of the Mechanical Superintendent, Hunter Building, Ottawa.

Persons tendering are notified that tenders will not be considered unless signed with their actual signatures, stating their places of residence. In the case of firms, the actual signature and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, equal to 10% of amount of tender, payable to the order of the Minister of Public Works. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

By Order,
L. H. COLMAN,
Secretary.

Department of Public Works,
Ottawa, October 29, 1923. 45

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Sanitary Sewers

TOWNSHIP OF YORK

Sealed tenders plainly marked as to contents will be received by the Township Engineer up to 12 o'clock NOON,

November 10, 1923,

for the providing and installing complete, of approximately 6,000 lineal feet of 12" Vitrified Sewer Pipe, together with the construction of a Reinforced Concrete Septic Tank.

Plans and specifications may be seen at the office of the undersigned, 40 Jarvis Street, Toronto.

The lowest or any tender will not necessarily be accepted.

F. B. GOEDIKE,
Township Engineer.

October 23, 1923. 44-45

Canadian National Railways

Electric Lines

Toronto Eastern Railway

Tenders for Trestles

Sealed tenders will be received at the office of the undersignd until the **26th** day of **November, 1923**, for Rebuilding of Trestles in the following localities:—

"A" at **Whitby**, **"B"** at **Oshawa**, **"C"** at **Bowmanville.**

Plans, specifications, and blank forms of contract may be seen at office of Resident Engineer, Toronto Eastern Railway, Oshawa, and at office of the Manager, No. 1 Toronto Street, Toronto.

All conditions of the Specifications and Contract must be complied with.

Tenders must be on blank form of tender which may be obtained from any of the offices at which plans are on exhibition. Tenders may be submitted for one or all of the locations, but a separate tender form must be submitted for the work at each location.

Each tender form must be accompanied by an Accepted Bank Cheque payable to the Canadian National Railways for an amount as follows:-

"A" at Whitby	**$200.00**
"B" at Oshawa	**600.00**
"C" at Bowanville	**400.00**

Lowest or any tender not necessarily accepted.

E. W. OLIVER,
Manager, Toronto Eastern Railway,
TORONTO, Ont.

Toronto, November 5th, 1923. 45-46

Equipment Wanted

Second hand Steam Shovel, 3/4 yard Dipper. Traction or Caterpillar mounting. Must be in good condition. Give full description to CITADEL BRICK LTD., QUEBEC, P.Q., CANADA. 44-45

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same.

Box No. 407, Contract Record, Toronto. 44 T.f.

Equipment for Sale

by

The Corporation of the City of Victoria B. C.

The Corporation of the City of Victoria, B.C., has for sale certain equipment used in the construction of the Johnson Street Bridge. The material for sale is as follows:

1	Land Derrick complete (less engine).
2	1 yard Concrete Buckets.
1	1 yard Smith Concrete Mixer and 9 x 9 Wache Vertical Steam Engine direct connected, also Hopper, Galvanized Iron Cylinder, Pipe and Fittings from Boiler.
1	Vertical Boiler, 25 H.P., 42 x 96, 148 lbs. working pressure will all fittings and Stack.
2	Cement Blowers.
1	Scow 27 x 90 with Sheds and Timberwork.
1	7 x 10 Double Drum Hoisting Engine. Timber Work for underwater Concrete guides also skid for 7 x 10 Engine.
1	12" Vertical Centrifugal Pump with 40' Shaft, Bearings, Guides, etc., also Timber Work.
1	12 x 8 Atlas Steam Engine.
1	piece 16" Double Leather Belt, etc. { 48 ft. Rubber 40 ft. Balatta Type 22 ft. Leather
1	72 x 108 Vertical Boiler.
1	No. 1 Union Iron Works Steam Hammer.
1	Diving Outfit complete, Pump, Scow, etc.
3	Diving Suits.
1	Derrick Scow complete, equipped with 9 x 10 American Hoist and Derrick Engine, also swinging Engine and all Fittings including Ejector, Westinghouse Air Compressor.
1	1-Yard Orange Peel Bucket.
1	Small Scow.

For further particulars and prices apply to the City Purchasing Agent, City Hall, Victoria, B.C.

E. S. MICHELL,
Purchasing Agent.

42-45

Tenders for Steel Bridge

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Thursday, November 22, 1923,

for the construction of the super-structure of the bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The bridge consists of a 100′ Bascule Double Leaf Span with steel approach spans of 98′ and 158′ and the work includes a Creosote block floor on the Bascule span and concrete floors on the approach spans.

Plans and specifications and form of tender and contract may be seen at the office of the undersigned, Chatham, Ont. A set of plans and specifications may be had by depositing Twenty-five ($25.00) Dollars with the undersigned, which amount will be returned when the plans are returned if a bona fide tender is put in by the party obtaining the plans.

Tenders must be accompanied by marked cheques for at least five percent of the amounts of the tenders.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
County Engineer.
43-46

Scow Wanted

WANTED: Scow about 18 x 30 or 20 x 35, with or without stiff-leg derrick. A. F. Fifield, St. Catharines, Ont. 45

Steel Sheet Piling for Sale

214 Pieces New Lackawanna Steel Sheet Piling 18 feet long, 14″ x 3/8″ Arch Web, Weight 40.8 lbs. per lineal foot.
Second Hand Lackawanna Steel Sheet Piling Same Section and weight—good condition.
109 Pieces—15 to 25 feet long.
102 Pieces—20 feet long.
8 Corners—20 feet each.

PORT ARTHUR CONSTRUCTION CO., LTD.
611 Excelsior Life Bldg., Toronto.
44-45

Dump Cars and Locomotive For Sale

6—16 yard Western air dump cars, wood bottom, steel sides and steel lined bottom, now in use at Port Weller, Ontario, on the Welland Ship Canal, hauling sand only, are nearly new and in first class condition.

Pennsylvania Switching engine, type 0-4-0, 144-2″ diam. tubes, boiler pressure 160 lb., cylinders 17″ x 24″, electric head lights front and rear, driving wheel 44″ diam., brake and straight air for dumping cars, tender 2700 gallons, coal 8000 lbs., weight 40 tons.

The above plant now in use and will be sold subject to delivery F.O.B. tracks Merritton, about November 20th, 1923.

National Sand and Material Co., Limited

Welland, Ontario

44-46

SITUATION WANTED—CONSTRUCTION SUPERINTENDENT or Inspector. Have had a wide experience in all branches of construction work, also draughtsman and estimator. Can give good references. Salary moderate. Box 387, Contract Record, Toronto. 39-45

Business Opportunity

A well established contracting and building firm desires to expand. Has work ahead and in view that will be very profitable. Solicits correspondence with contractor, builder or other parties with good financial standing. Apply Box 399, Contract Record, Toronto. 42-45

STEEL PILING

Bought and Sold

Universal Equipment Company
28-t.f. **Niagara Falls**

Power Plants, Electricity and Telephones

(Continued from page 55)

into hydro system and developing resources on the Sauble River.

CONTRACTS AWARDED

Melville, Sask.

A. L. Zeigler, Melville, Sask., has the general contract for $43,500 power plant for the town of Melville. Architects are Kipp-Kelly Co., Ltd., Winnipeg, Man.

Toronto, Ont.

Excavating work is being done for $160,000 sub-station south east corner Danforth Ave. and Morton Rd., for Toronto Electric Commissioners. The following sub-trades have been let; reinforced steel—H. C. LeFroy Engineering Co.; structural steel—McGregor & McIntyre, Ltd.; plumbing—Wright Bros.; cut stone—Geo. Oakley & Son Ltd. General contractors are Jackson-Lewis Co., Ltd.

Toronto Electric Commissioners, 225 Yonge St., have awarded the general contract for $12,000 annex to sub-station corner Duncan and Nelson Streets., to Archibald & Holmes, 709 Yonge St.

Woodstock, N. B.

Conn. W. F. Anderson, Lakeville, N. B., has been awarded the general contract by the Carleton Electric Co., Ltd., Woodstock, N. B., in connectio with $80,000 power line extension, Bridgewater, Maine to Woodstock, N. B. Poles have been placed, Bridgewater to Woodstock, 60 miles. Engineer in charge is Mr. Brown, Presque Isle, Maine.

Weston, Ont.

The following sub-trades have been let on $40,000 telephone exchange; structural steel—Hamilton Bridge Works Co., Ltd.; reinforced steel—Burlington Steel Co., Ltd.; millwork—R. Laidlaw Lumber Co., Ltd.; roofing and sheet metal—W. A. Moffatt, 86 Don Esplanade, Toronto; miscellaneous iron — Shipway Iron & Wire Mfg. Co., Ltd. Plastering, painting and glazing to be let by general contractors, Wells & Grey, Ltd., Confederation Life Bldg., Toronto.

Miscellaneous

Grand Mere, Que.

Work has just started blasting new channel costing $10,000 on River St. Maurice, for the Laurentide Co., Ltd. Engineer is E. B. Wardle. Work by day labor.

Goderich, Ont.

Tenders are being received till November 13 by the Department of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for towing, docking, repairs, renewals and painting, tug, "Hercules" and steel hopper scows 14 and 15. Specifications at Department, and office of the mechanical superintendent, Hunter Bldg., Ottawa, Ont.

CONTRACTS AWARDED

Malagash, N. S.

Fraser Paving & Contracting Co., Ltd., New Glasgow, have the contract for dredging at $21,400.

Port Lorne, N. S.

Reid Construction Co., Granville Ferry, N. S., have the general contract for breakwater extension at $7,160.

Pictou Harbor, N. S.

Tenders are being received till November 15 by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for towing, docking, repairs, renewals and painting in connection with repairs to steel hopper scow No. 108. Specifications at Department, offices of Mech. Superintendent, Hunter Bldg., Ottawa, Ont., and District Superintendent of Dredgers, St. John, N. B.

St. John, N. B.

The contract for dredging has been awarded to St. John Dry Dock & Shipping Co., Ltd., East St. John, at $38,400.

Thessalon, Ont.

The contract for breakwater extension has been awarded to V. T. Bartram, Bank of Toronto Bldg., Toronto, at $38,321.

Late News

Bowmanville, Ont.

The following sub-trades have been let on $7,500 residence being built on Scugog St., for Walter H. Lyon; euectric—Gus. Bounsall; heating and plumbing—Greenaway & Elliott; plastering—Mr. Mutton; painting—H. Dilling. H. L. Quinn is the general contractor.

Burlington, Ont.

The contract for concrete sidewalk on Brant St. has been awarded by the town council to Ezra Case.

The town council has awarded Ezra Case, Burlington, the contract for watermains on Emerald St. from Caroline St. to town line. Engineers are MacKay & MacKay, Home Bank Bldg., Hamilton, Ont.

Esquesing Twp., Ont.

Mechanical Trades Co., Ltd., Toronto, have the contract for heating and plumbing of $25,000 residence, greenhouse, etc., for Dr. Beatty, R.R. No. 4, Aston, Ont. Alfred J. Raynor, R.R. No. 4, Acton, is the builder. Architects, Wm. F. Sparling & Co., 54 University Ave., Toronto. Balance of work by general contractor.

Fredericton, N.B.

Fred. J. Tims, 376 Charlotte St., has the general contract for rebuilding business block on York St., at a cost of $50,000, and will let electric, heating, and store fronts.

Halifax, N.S.

Time for receiving tenders by deputy minister, F. C. T. O'Hara, Parliament Bldgs., Ottawa, Ont., in connection with $1,200,000 grain elevator and conveyor galleries, has been extended till November 15. Plans and specifications with deputy minister. Engineers are John S. Metcalfe Co., Ltd., 54 St. Francois Xavier St., Montreal, Que.

London, Ont.

Tenders are being received by the architects, Pennington & Boyde, Bartlett Bldg., Windsor, Ont., in connection with $500,000 seminary to be built for St. Peters Seminary, Dufferin Ave.

Listowel, Ont.

Tenders are being received till November 20, by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, for new floors in armoury. Plans and specifications at offices of chief architect, Dept. of Public Works, Caretaker Pub. Bldg., Listowel, and resident architect, Dept. Public Works, General Post Office, Toronto. A 10% cheque required.

Montreal, Que.

Foundations are going in for grain elevator for Canada Linseed Oil Mills, Ltd. Engineers, John S. Metcalfe Co., Ltd.; general contractors, Atlas Construction Co., Ltd.

A. Lamontagne, 577 Fabre St., is the owner and builder of 2 residences, $12,000, on Des Erables, between Mt. Royal and Gilford. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Niagara Falls, Ont.

B. A. Cook, Ferry St., has the general contract for $7,000 store and 2 apartments on Ferry St., for F. J. Booth. Electric, heating and plumbing to be let.

Outremont, Que.

Foundations are going in for 2 flats and garage, $13,500, on Durocher, near Lajoie. John Brown, 83 Dorchester W., is the general contractor. Architect, A. Potvin, 26 St. James St. Sub-trades to be let.

J. A. Joly, 2485 Park Ave., is the owner and builder of $50,000 apartment house on Bernard, corner Wiseman. Architect, Perreault & Gadbois, 2100 Park Ave. Electric to be let.

Manseau & Beaulieu, 375 West Hill, have the general contract for $9,000 cottage being biutl on Dunlop, near Van Horne, for V. A. Fournier, 2578a Waverly. Sub-trades to be let.

Stratford, Ont.

Wm. Newman, 55 Cherry St., is the owner of 20 residences, $60,000 being built here. A. McKay, Harrington, Ont., has the contract for plastering on two of them.

Toronto, Ont.

The walls are going up for paint plant for R. Elder Carriage Works Ltd. Following sub-trades have been let; structural steel—Hepburn & Disher, Ltd.; steel sash—Canadian Metal Window & Steel Products Co., Ltd. Carpentry and masonry by general contractors, Thomson Bros.

The following sub-trades have been let on 7 residences, $6,000 each, north side Strathmore, near Woodmount Ave.; electric—Mr. Reid, 61 Rhodes Ave.; plumbing—A. T. Steven, 516 Yonge St.; heating—Howard Furnace Co. Plastering, painting and tiling to be let. Owner and builder is W. H. Kerwin, 47 Keystone Ave.

Fred. Mishaw, 340 Kingswood Rd., is the owner and builder of 3 pair residences, $18,000, north side Erskine Ave., near Redpath Ave., and will let painting, plumbing, heating, electric and plastering trades. Masonry by day labor.

Foundations are in for 4 pair residences, $6,000 pair, south side Milverton Blvd., near Coxwell Ave. McDonald & Miller, 33 Woodycrest, are the owners and builders. Painting, plastering, plumbing and electric to be let.

Excavation work is being done for 3 residences at 271-3-5 Concord Ave., costing $18,000. D. Patterson, 784 Ossington Ave., is the owner. Plumbing, heating, electric, painting and plastering trades to be let.

A. B. Ormsby & Co., Ltd. have the contract for steel doors, and H. Griffiths & Co., 1128 College St., the contract for plumbing, for $12,000 annex to sub-station, corner Duncan and Nelson Streets for Toronto Electric Commissioners. General contractors are Archibald & Holmes.

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives

Fidelity Insurance Co. of Canada

STANLEY MOSS MANAGER

FIDELITY AGENCY OF CANADA LIMITED
THIRTY SIX TORONTO STREET

The High Cost of Selling

can be reduced by the use of MacLean Building Reports. They will save the time wasted on unproductive calls and "missionary" work, and enable your salesmen to concentrate on live prospects in the

Building and Engineering

trades You get definite information. You can direct and time your sales effort so as to give it the maximum efficiency. MacLean Reports are building business for hundreds of progressive firms. Why not for you, too?

Write for full information.

MacLEAN BUILDING REPORTS
LIMITED
345 Adelaide St. W., - - TORONTO
285 Beaver Hall Hill - - MONTREAL
325 Main St. - - - WINNIPEG
106 Winch Bldg. - - VANCOUVER

WE WILL BOND YOU

Our Credit is vast and if you add it to your own, you have a pretty strong argument, that you should get the job.

Resources over - - $31,790,000
Canadian Securities - $ 2,247 500

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UNITED STATES FIDELITY & GUARAN
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Check up on depreciation in buying your next motor truck. **FEDERAL** Modern Designed Trucks are built to last longer and operate for less money.

Another **FEDERAL**

Means Another Satisfied Customer

Toronto, Ont. - - **Jones Motor Company**
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Montreal, Que. - - **Lymburner Motors Inc.**
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Windsor, Ont. - - **Thompson Auto**
339 Pitt Street West

FEDERAL MOTOR TRUCK CO.
Detroit, Michigan

Advantages of a Variable Climate

The advantages of a variable climate are obvious. Compare the civilization of the Polar Regions and the Tropics with that of Temperate Zones.

Think then of the distinctive advantages your building will have when equipped with a Sturtevant Heating and Ventilating System—a flexible system which provides a comfortable, healthful inside climate the year 'round, warm as toast in winter, delightfully cool in summer—and humidity apportioned to the just-right degree.

Interesting details in Folder 606, sent complimentary on request.

B. F. Sturtevant Company
of Canada, Limited.
Montreal Galt Winnipeg Toronto

Sturtevant
PUTS AIR TO WORK

Liquid Air Used to Make Cold Tests of Zinc

In investigating the properties of zinc roofing, cold tests were recently made by the United States Bureau of Standards on zinc nails and rivets. These were driven at room temperature, then cooled to a low temperature by liquid air, and warmed up again to room temperature without producing any appreciable change. Driving the nails at temperatures from 32 deg. F. to 40 deg. F. developed a brittleness in most of the nails, the heads flying off of those with out fillets. In the case of nails with fillets, the heads did not break off. At 31 to 40 deg. F. some of the zinc sheeting became brittle and cracked when pounded. Efforts are being made to determine what types of zinc, if any, will endure such tests.

Tractor Versus Horses for Towing

The substitution of an American tractor for horses for towing, has proved successful at Colwick, near Nottingham, England. A tractor, weighing a little over a ton, was employed for hauling a loaded gravel barge of 80 tons a distance of about three miles. The trip was completed in 55 minutes.

This method of towing a barge, which is unique in the United Kingdom, was adopted by the Trent Concrete Company. By the change, it is now possible to double the amount of work formerly done, that is, by the tractor is able to make five round trips a day as against the two and a half trips by three horses attached to one barge.

Stone Turf Houses

A new building material is now being used to a considerable extent in German Silesia, says an exchange. This consists of stone-turf. Strips of turf are arranged within a wooden framework and solidified by means of cement and chalk. The turf is hardened into a sort of stone, a four-centimeter plate of this material being tougher than a brick wall. The new building material has the advantage that much less wood moulding is required than in the case of concrete, and the stone-turf is superior in insulating qualities against heat and damp. Stone-turf houses are 40 per cent cheaper than those built of any other material.

Port Improvement in Chile

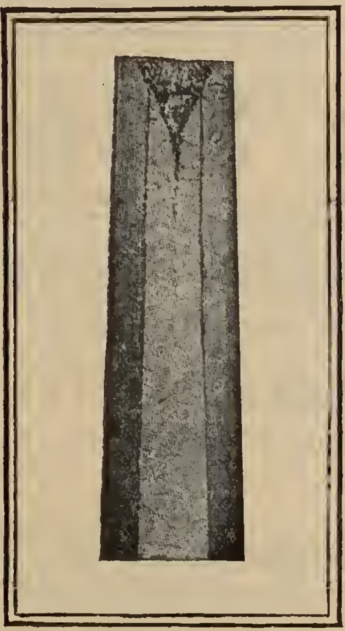
An executive decree, published in El Diario Oficial, fixes January 3, 1924, as the date of bids for the construction of the port of Lebu, Chile, for which purpose the sum of £930,000 has been authorized. The concession for the operation of the port will be awarded on the conditions set forth in the plans of the Chilean Ports' Commission, which may be consulted at the Chilean consulate in New York City.

Reconstruction of Earthquake-Destroyed Territory

Plans are under way for the reconstruction of Copiapo, Vallenar, and the rest of the zone in the north of Chile recently destroyed by earthquakes. The Chilean Government has delegated the authority for the financing and supervision of this work and a commission of engineers has been instructed to decide upon the methods to be employed in the reconstruction.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA



Steel ingots which has been cut in half showing the "pipe" in the centre and the porous segregated portion at the top. In the manufacture of rail steel the ingot is carefully cropped to remove all pipe and segregation, thus insuring a steel of the highest quality.

Quality and Metal Fatigue

The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation,, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity. and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in exactly the same condition as it was prior to its years of service.

RAIL STEEL BARS rolled from railroad rails have provided a concrete reinforcement of quality—quality obtained through care in manufacture—a degree of quality possessed by no other reinforcement steel.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14.

Send for This Valuable Booklet—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

DAKE MACHINERY

Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.

Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.

Canadian Office 45 Adelaide St., E. Toronto, Ont.
Capt. Wm. Stitt, Can. Sales Mgr.

RAILS

New 12 to 105 lb. complete with Fastenings, Bolts, Spikes, Switches, Tie Plates and etc.

Relaying Rail, 20 to 100 lbs.

John J. Gartshore Limited

58 Front St. West, Toronto

In Stock

STEAM SHOVELS
Revolving and Railroad Type

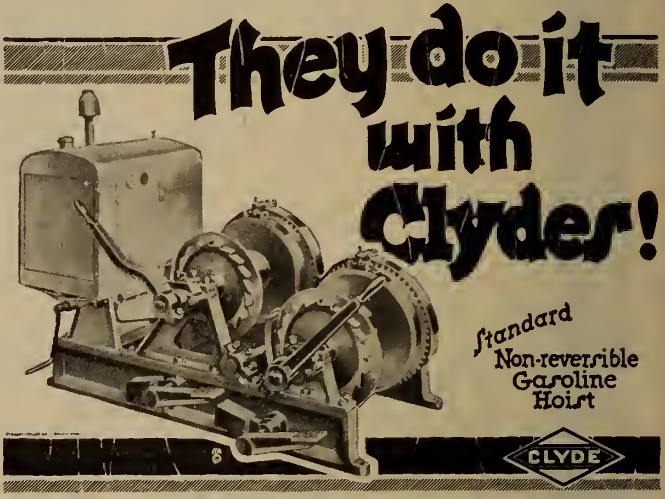
LOCOMOTIVES
Standard, 36″ and 24″ Gauge

CARS
Ballast; 20 yard; 6 yard; 4 yard; 3 yard; and 2 yard

DERRICKS, HOISTING ENGINES
AIR COMPRESSORS, RAILS

Eastern Equipment Co.
Limited

MONTREAL, QUE. DORVAL, QUE.
P. O. Box 792



"Our Clyde 15 H. P. gasoline hoist is a dandy. We recently made a 26-hour continuous run and it didn't miss a lick. It was as peppy at the finish as at the start. We do not hesitate to recommend it. BURT & TRIPP, Herington, Kans."

A repeat order is built into every Hoist of CLYDE make. And you'll find more power than the rated capacity. Write for information.

You'll take pride in your CLYDE!

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Tenders

A few dollars spent in advertising your proposals in

The Contract Record

would result in additional competition which might save your city or town or your client many hundreds of dollars.

Tarvia-KP

FOR COLD PATCHING

Patching break in street with "Tarvia-KP" mix.

Making the mix—"Tarvia-KP" sand and stone—by hand on the job

"Stitch-in-Time" Road Work Pays—

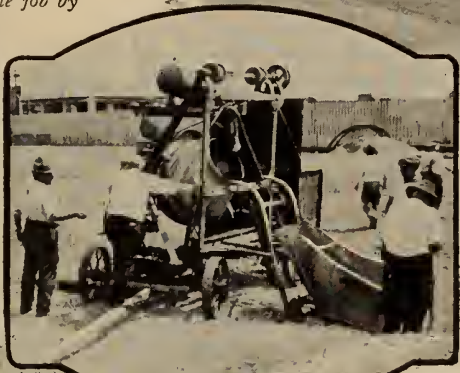
YOU have heard the old saying that "a stitch in time saves nine." This applies to road repairs—and "*in time*" means now. Patch the roads under your supervision with "Tarvia-KP" this Fall and it will save expensive repair work in the Spring—will maintain these roads in prime condition during the entire winter.

Furthermore by getting repairs out of the way now you can get an early start on your Spring surfacing and new construction.

"Tarvia-KP" is a bituminous road patching material for every type of road. It is quick, dependable, always ready. It requires no heating, is extremely easy to handle and will stand up under the heaviest traffic. Can be mixed in spare moments, stored, and used at any time. Freezing does not injure it.

Let us mail you an interesting booklet which shows each step in patching a road with "Tarvia-KP." Address your request to our nearest office.

Another method—"Tarvia-KP" mix made on the job by machinery.



"Tarvia-KP" mix made in city yard in quantity for future use.

"Tarvia-KP" mix is shoveled into break in road and well tamped.

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HALIFAX, N. S.

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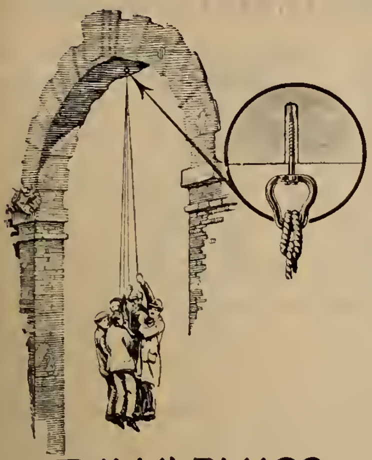
LIMITED

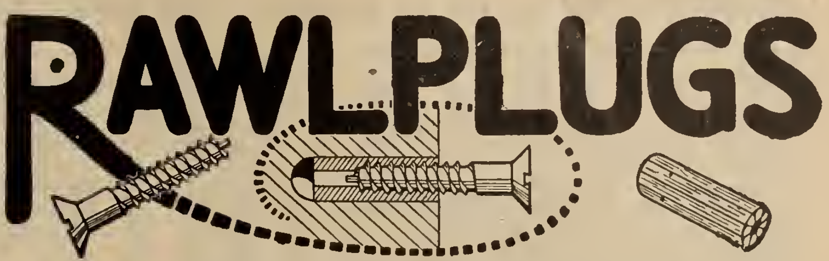
MONTREAL TORONTO
ST. JOHN, N. B.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.50 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50-6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS:—.Discount on flue linings is 55%





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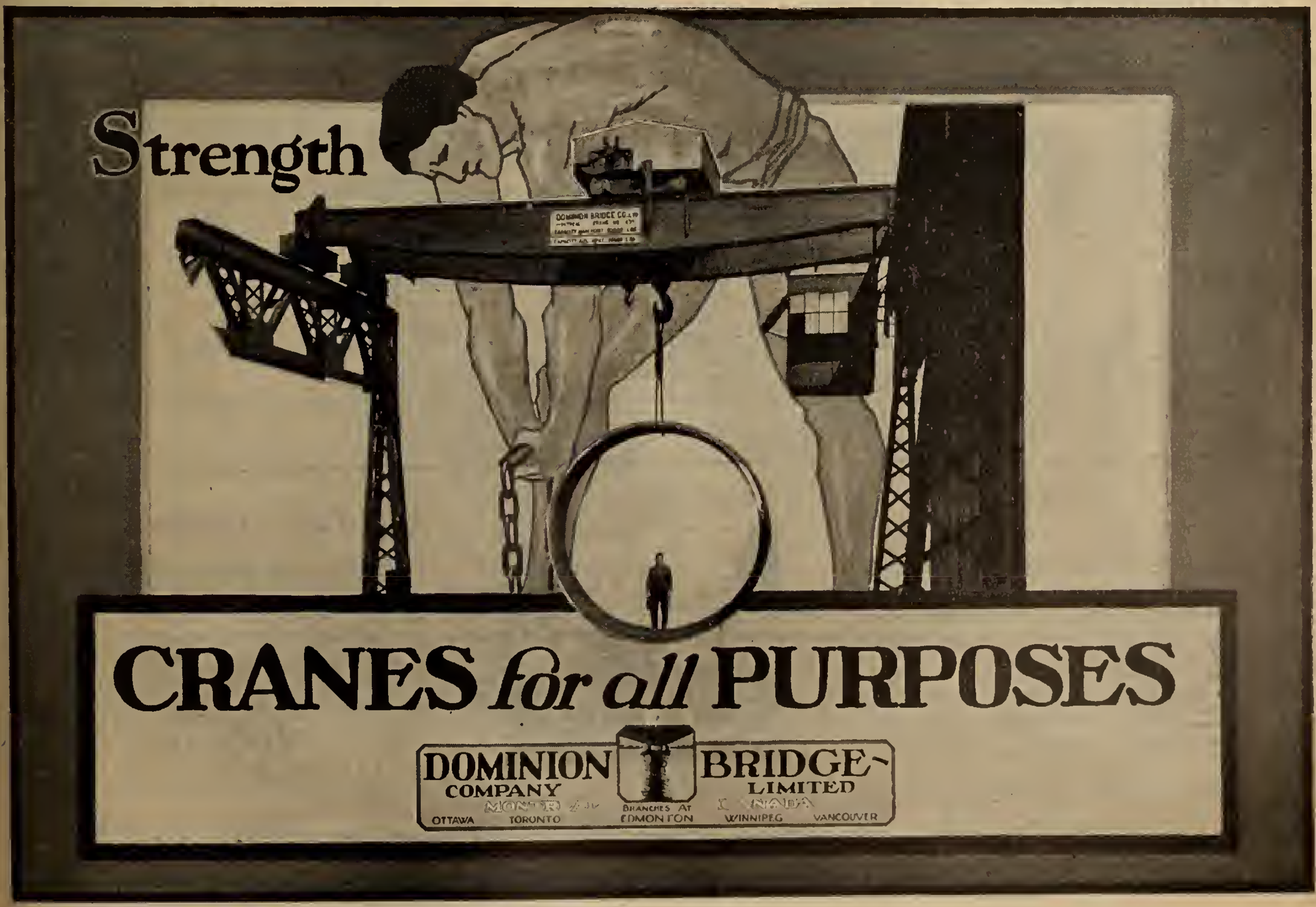
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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.60
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	**per hr.**	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	**per hr.**	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

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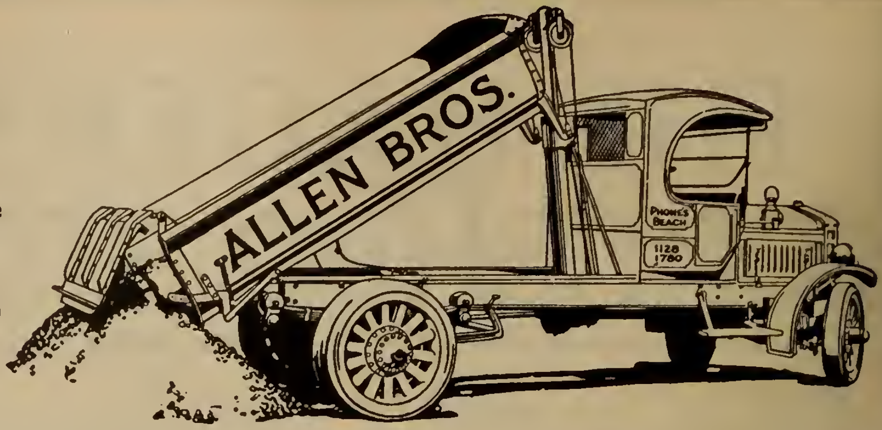

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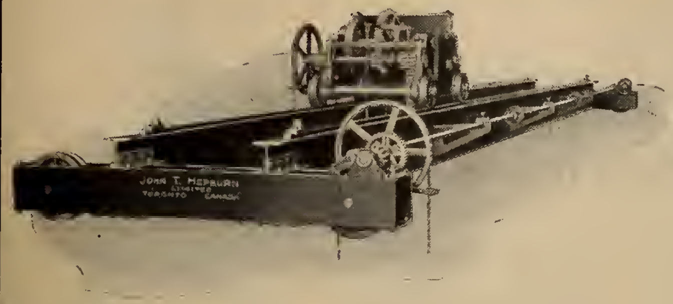

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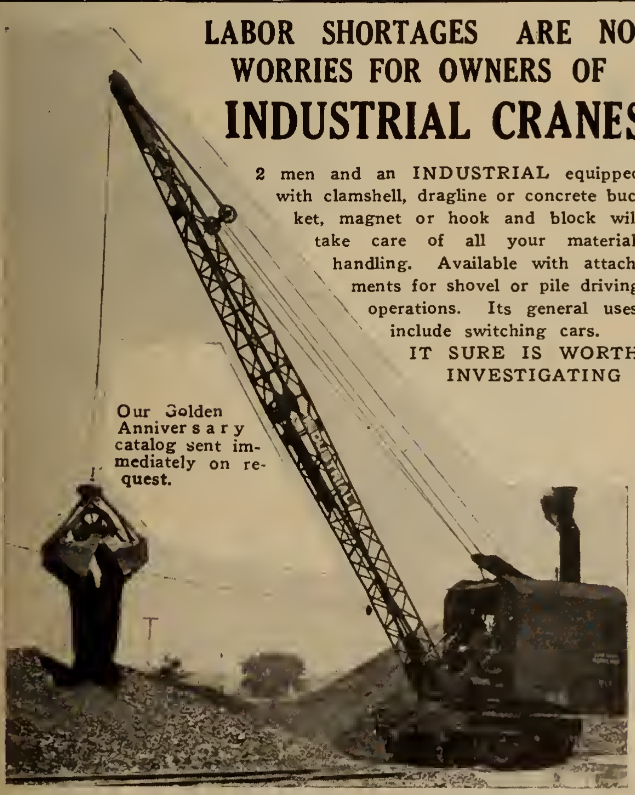

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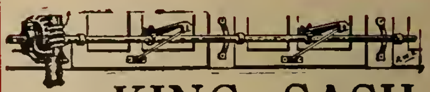

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All Cut Stone, Windows, Doors and Stone Trim on this building cut and delivered by

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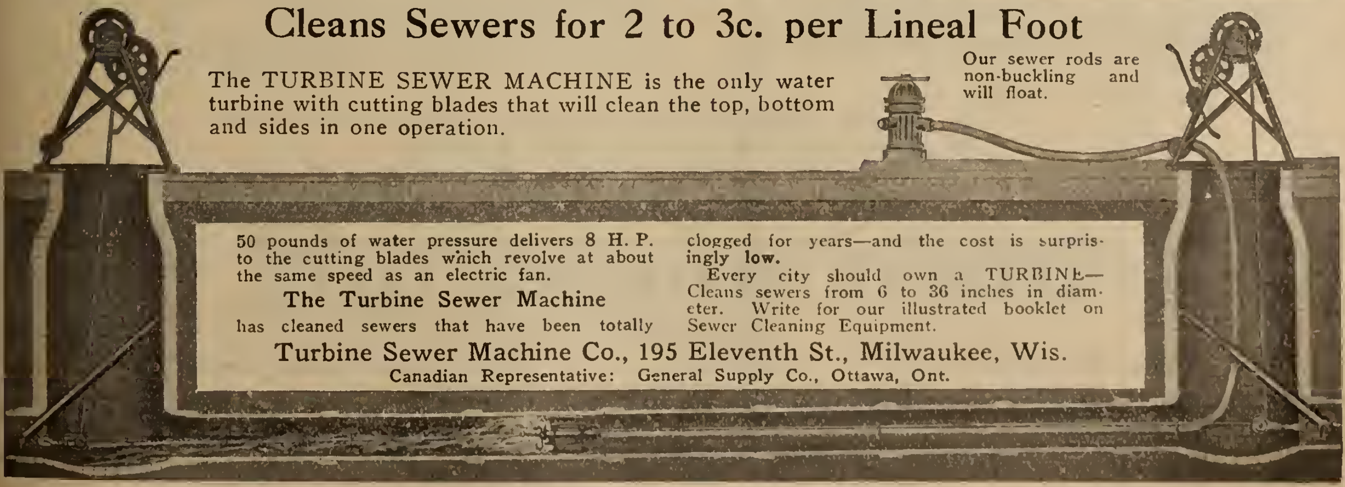

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The Turbine Sewer Machine has cleaned sewers that have been totally clogged for years—and the cost is surprisingly low.

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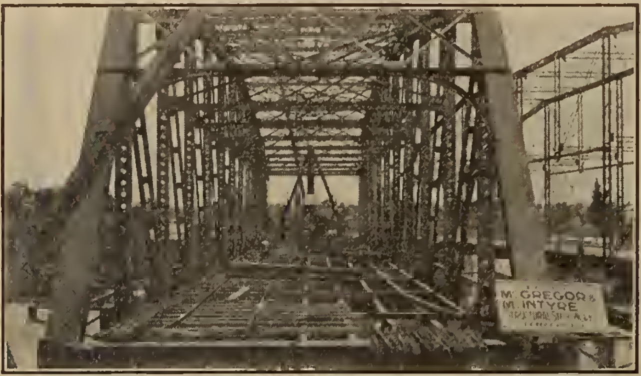

192′ 0″ Clear Span Highway Bridge over Thames River, North Richmond St., London, Ont. Erected 1922

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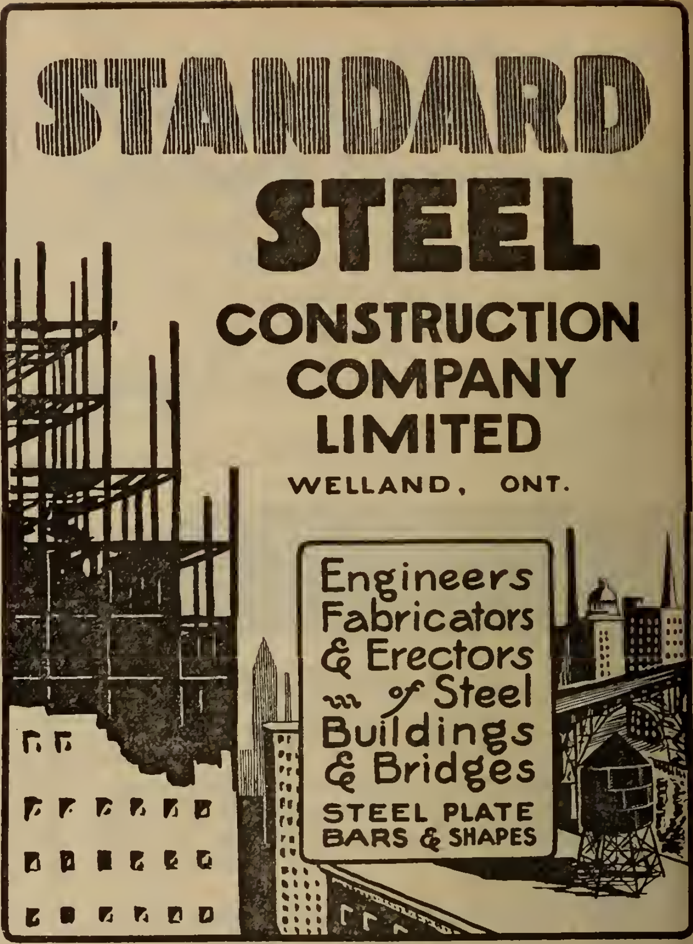

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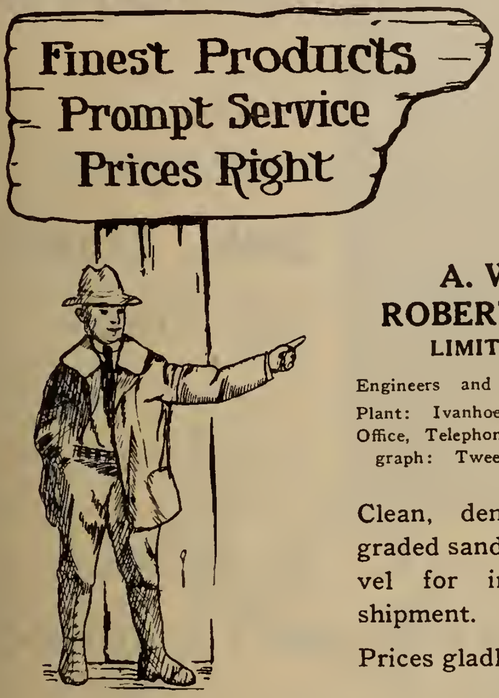

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Write for our Graphic Catalogues or we will be glad to supply you with any special data you require governing the use of any of our products.

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Prices right.
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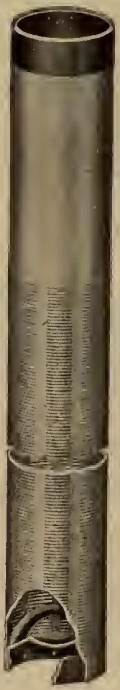

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Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well strainer.

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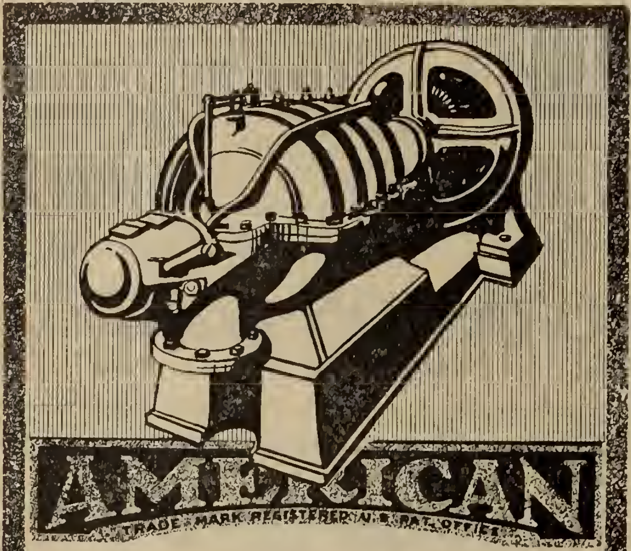
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Put the Bull-Dog on *your* Pay-roll

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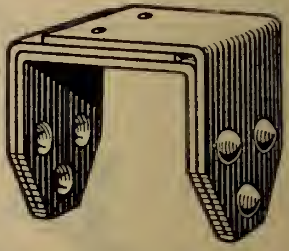

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are essential in the handling of materials and can best be obtained with the

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Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,
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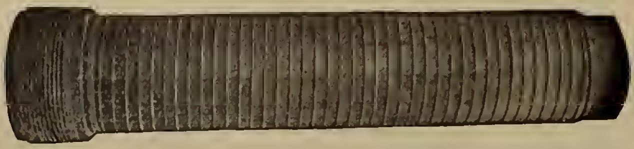

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See our new patented Wood Pipe Coupling—Positively LEAK PROOF

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SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

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Sole Manufacturers under Canadian and U. S. Letters Patent

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Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

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"CAST IRON PIPE has the
Greatest Resistance
to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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Works at: Fort William, Ont., St. Thomas, Ont
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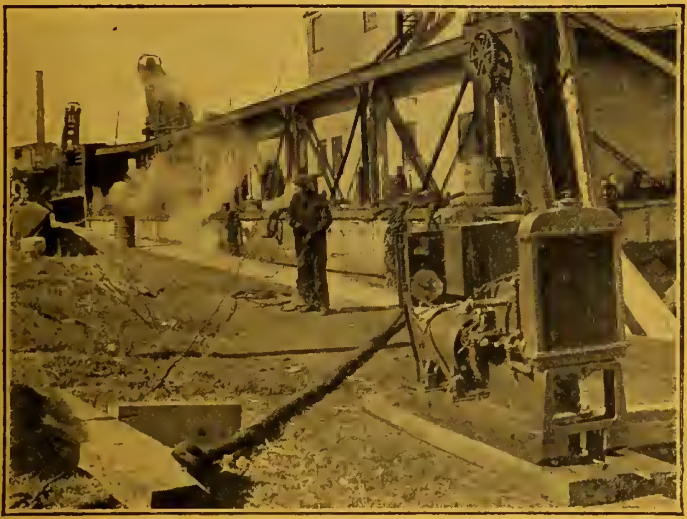

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Contractors!

Take advantage of our Electric Welding Service in case of breakdown. It often saves time and money to take the welder to the job rather than the job to the welding shop.

Boilers, Steam Shovels, Hoisting Engines, Cylinders, etc., repaired at moderate cost.

Quotations gladly submitted.

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OSGOOD

Steam Shovels

As GOOD as the name

An OSGOOD 29 keeps the dirt moving

Dependability, Reliability, Service mean a lot to the man who has a contract that must be completed on time—and without loss. But these things mean MORE when backed by an old and experienced Manufacturer. OSGOODS have stood the test of time and hard usage.

You will make no mistake when you buy an OSGOOD

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The OSGOOD Company, Marion, Ohio, U.S.A.

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IS YOUR GUARANTEE OF QUALITY

of

WIRE ROPE

Blocks, Clips, Thimbles, Turnbuckles, &c.

THE DOMINION WIRE ROPE CO. Limited

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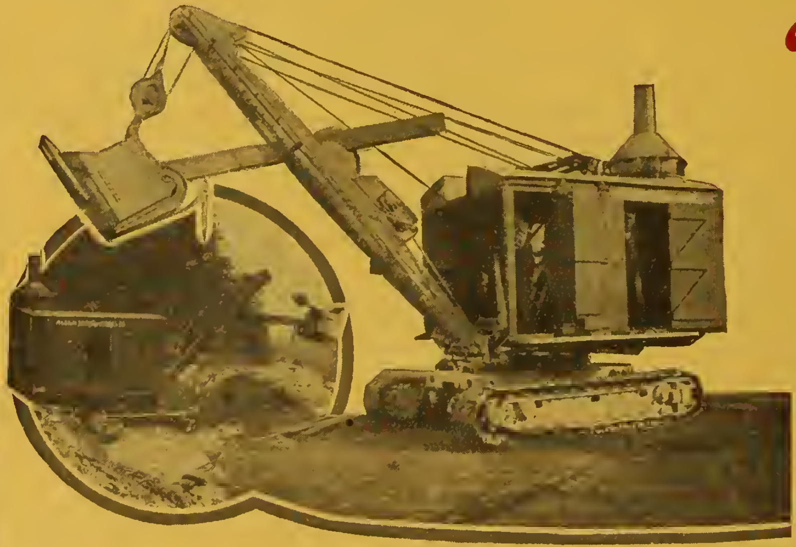
Gasoline Locomotives

"Industrial Works" Cranes and Pile Drivers; Hoisting Engines, Derricks.

"Ransome" Concrete Mixers, Carts, Hoist Buckets, Bins, Towers, "CARBIC" Lights—Salamanders.



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Steam Shovels

Absolute steering control from cab.

Greater bail pull at dipper.

Faster dipper speed.

More powerful hoisting engines.

More speed, greater power, longer life.

Branch:
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Telephone Adelaide 840

F. H. Hopkins & Co. Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, November 14, 1923 No. 46

Contract Record and Engineering Review

"Black Base"

The Asphaltic Concrete Foundation with many worth-while Advantages ~

Out on the Dundas Road, the new Provincial Highway via Cooksville from Toronto to Hamilton, an interesting example of Asphalt 'Black Base' pavement has just been completed by the Dufferin Construction Company Limited for the Ontario Provincial Department of Highways.

This type of Asphalt construction has all the well-known advantages of Asphalt pavements and in addition embodies increased flexibility, greater resiliency, complete waterproofing of the subgrade, quicker construction, the use of the same aggregate materials throughout, simpler maintenance and yet costs substantially less.

An interesting illustrated folder has been prepared, covering the special features of "Black Base" at greater length. If you have not received a copy, we will gladly send you one on request.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

IMPERIAL
Asphalt
PRODUCTS

1. View of the finished highway at Tansley,

2. Showing "Black Base" with gang following up laying top course.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

WOOD PIPE HAS BEEN PERFECTED

EFFICIENCY!

Steel
Double-Coupling
eliminates
all leaks

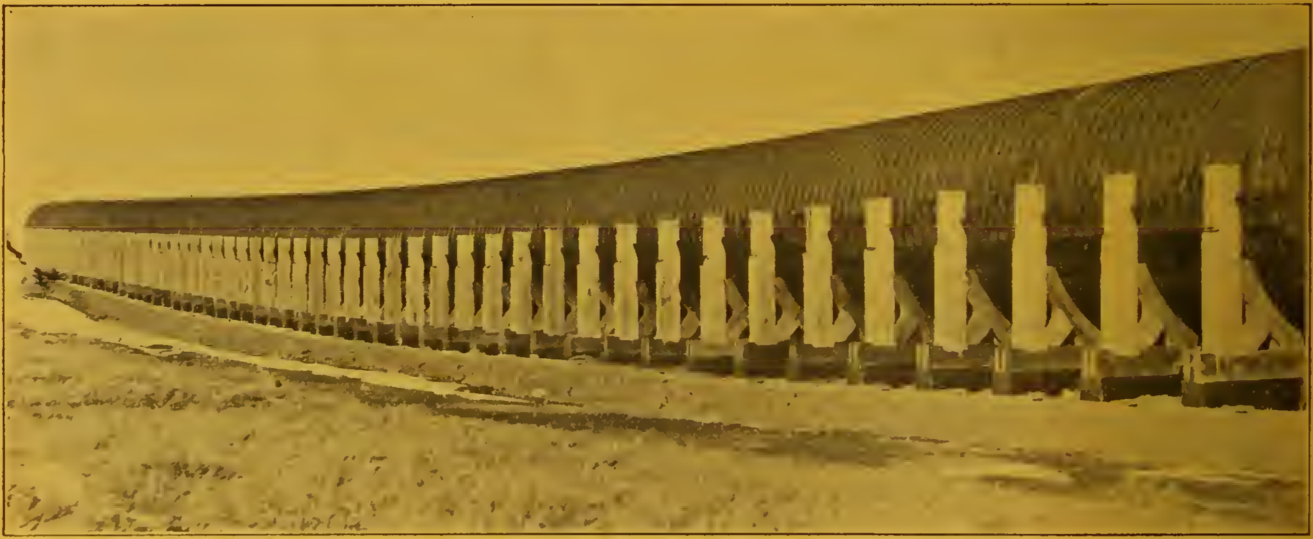
DURABILITY!

Double
Burlap Jacket
secures permanency
in all soils

TWO MILES of GOOD PIPE for the PRICE of ONE

Those who cling to the theory that a combination of efficiency and durability is possible only with Metal Pipe at a fancy price, have not fully investigated the improved standard of Wood Pipe. RESULTS in several Western Municipalities are most convincing.

WIRE-WOUND WOOD STAVE PIPE
CONTINUOUS STAVE PIPE
WOODEN TANKS
SILOS



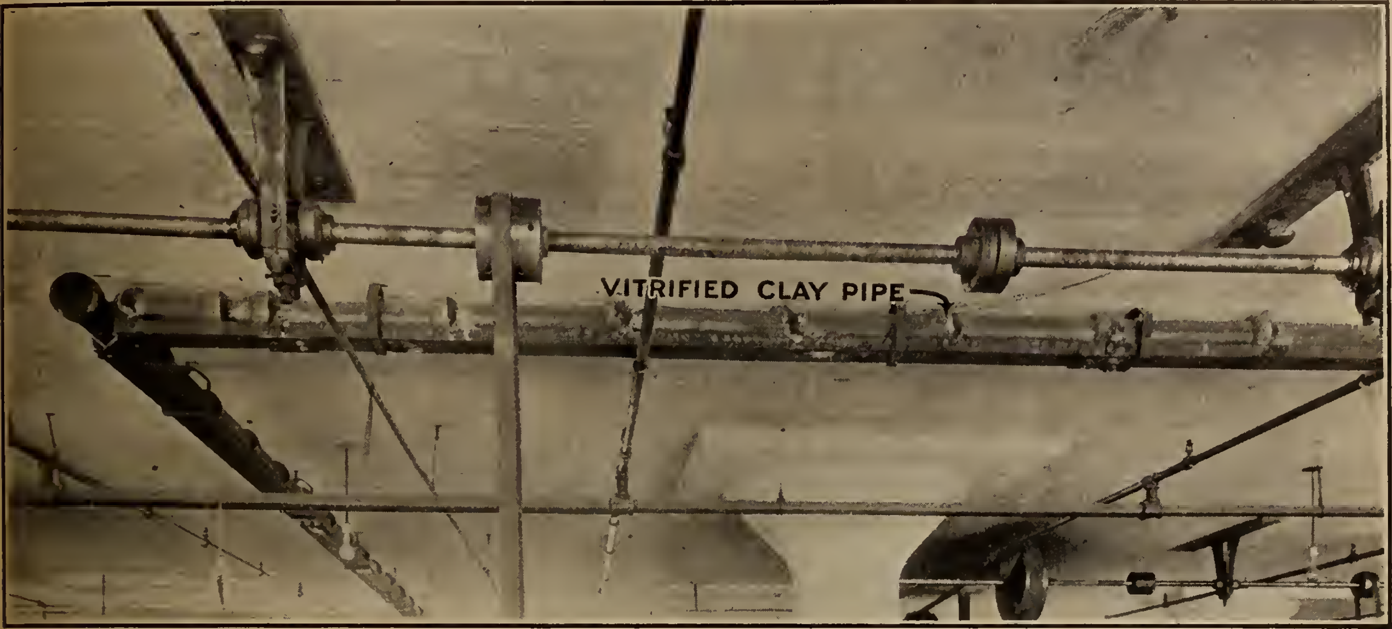
Continuous-Stave Pipe, 10½ feet in diameter, built by us for Lethbridge Northern Irrigation District (Alberta)

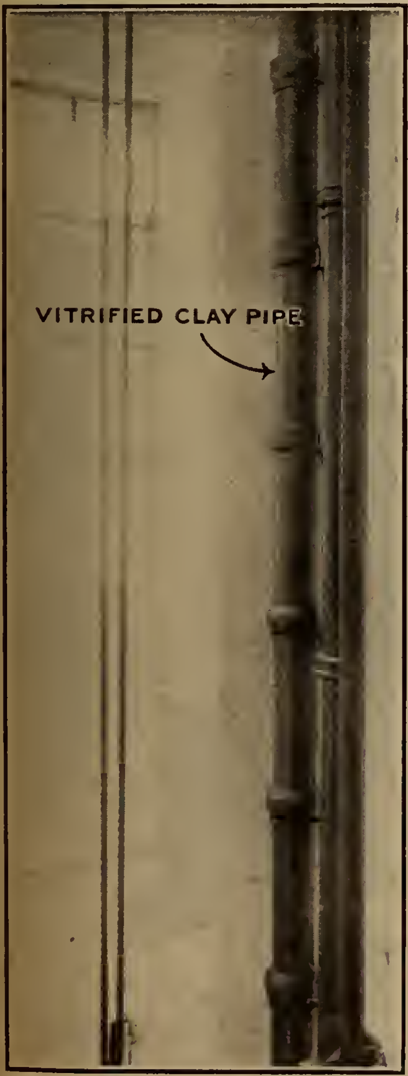
Let us quote on your requirements—Catalogue forwarded on request.

CANADIAN PIPE COMPANY, LIMITED

550 Pacific St., VANCOUVER, B.C.

DAMAGE TO SEWERS BY INDUSTRIAL WASTES





The illustrations show how acid wastes from a Toronto factory are safely conveyed by Vitrified Clay Pipe suspended from the ceiling and down three floors on the walls of the elevator shaft to sewers that are also constructed of Vitrified Clay Pipe.

The importance of constructing sewers to withstand the action of Industrial wastes is indicated by a statement made at a recent conference on Industrial Waste Pollution as reported in the Engineering News Record of October 25th, 1923.

> "A striking example of the damage to sewer sometimes done by industrial wastes was cited by Maj. Vogleson. About 1,700 ft. of invert of a concrete sewer was ruined within three weeks of the time that there began to be discharged into it some heavy acid wastes from an industrial plant. This sewer is of the basket section type, equivalent in cross-sectional area to about a 7-ft. circular sewer. The invert to a width of some 30 in. has been badly damaged, the acids in some cases penetrating to a depth of 7 or 8 in. It is estimated that it will cost $70,000 to repair this stretch of sewer."

Vitrified Clay Pipe and Vitrified Clay Segment Block will resist all acids and alkalies and secure permanent and efficient sewers.

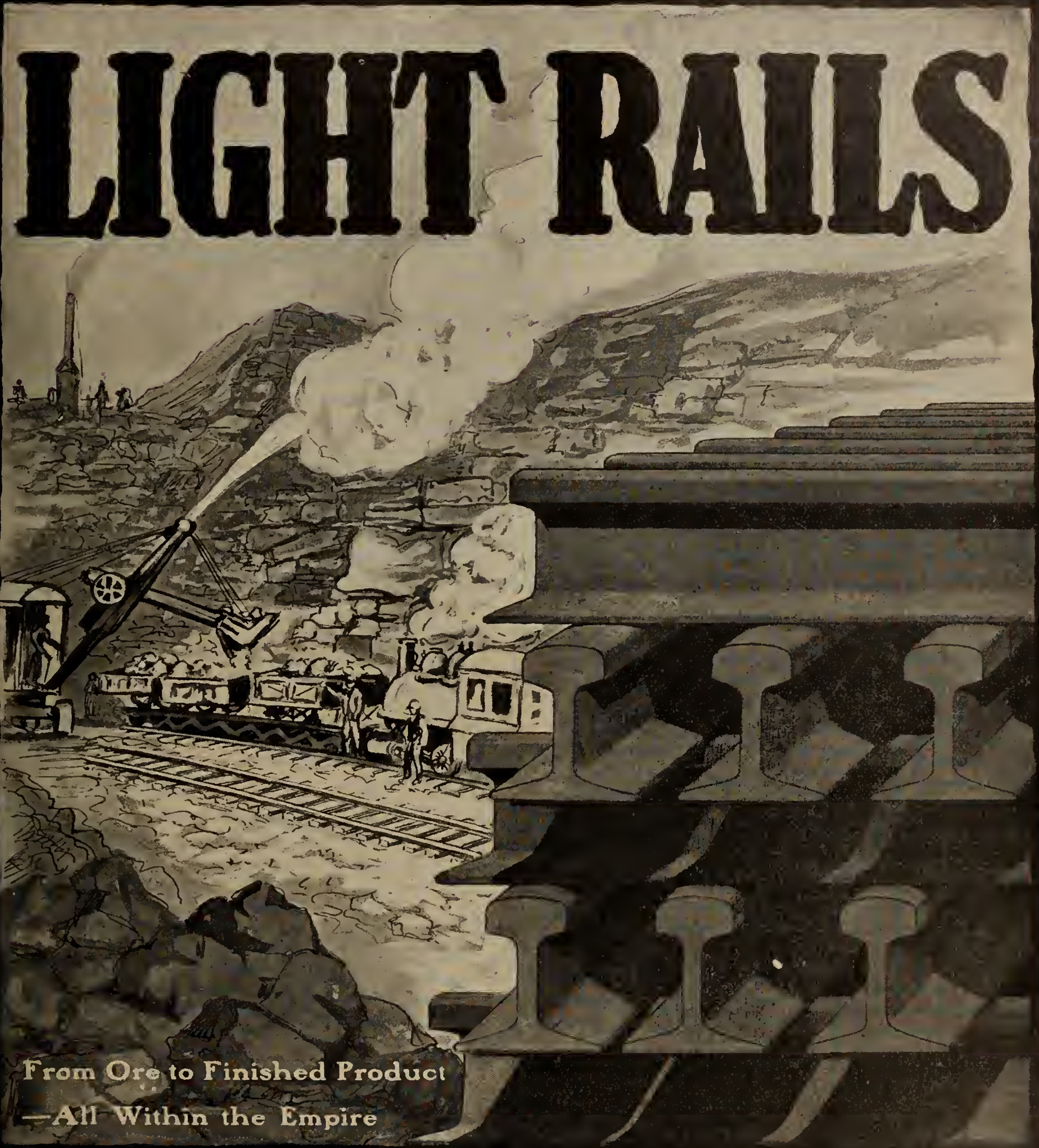
Vitrified Clay Pipe Publicity Bureau, 9 Wellington St. East, Toronto
St. Johns, P.Q. New Glasgow, N.S.

Record of Performance is the Best Advertisement

The structural steel framework for the new Bell Telephone Co. Building, Toronto, is shown herewith. In the background of the illustration may be seen four of the largest buildings in the British Empire, the King Edward Hotel, the Royal Bank, the C. P. R. and Dominion Bank Buildings, all of which are monumental tributes to the world-wide record of structural steel.

BUILD WITH STRUCTURAL STEEL

Issued by the Structural Steel Association



Light Rails for Mines, Construction Operations
and General Contractors' Use
(from 12 to 45 pounds per yard)

BRITISH EMPIRE STEEL
CORPORATION LIMITED
CANADA CEMENT BUILDING MONTREAL, CANADA

Western Representatives, Bissett & Webb, Limited Winnipeg

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  - Sturtevant, B. F. & Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
  - Canadian Blower & Forge Co.
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- Aluminum
  - Spielman Agencies Regd.
- Architectural Iron
  - Canadian Welding Works
  - Northern Architectural Iron Works
  - Canada Wire & Iron Goods Co.
  - McGregor & McIntyre
  - Meldrum Iron Works Ltd.
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- Blast Gates
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Block (Wire and Manila Rope)
  - Clyde Iron Works Sales Co.
  - Hopkins & Co., Ltd., F. H.
- Blowers and Compressors
  - Canadian Ingersoll Rand Co.
  - Canadian Blower and Forge Co.
  - Sturtevant, B. F. & Co.
- Bodies (Steel and Wood)
  - Wood Hydaulic Hoist & Body Co.
- Boilers
  - Canadian Ingersoll-Rand Co.
  - Engineering & Machine Works of Canada Ltd.
  - F. H. Hopkins & Co., Ltd.
  - Inglis Company, John
  - McGovern, T. J.
  - Mussens Limited
  - Waterous Engine Works Co.
- Boiler Inspection
  - Trades Labor Branch Dept. Public Works
- Boxes—Junction
  - Standard Underground Cable Co., of Canada Limited
- Box Rails
  - Midwest Canada, Limited
- Boxes (Valve)
  - Jenkins Bros. Ltd.
- Brick Dryers
  - Canadian Blower & Forge Co.
- Brick Machinery & Supplies
  - Hepburn, Ltd., John T.
- Bridges
  - Hamilton Bridge Works Co.
  - Standard Steel Construction Co.
- Bridges (Steel)
  - Canadian Des Moines Steel Co.
  - Dominion Bridge Co., Ltd.
  - Hamilton Bridge Works Co.
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Buckets
  - Canadian Austin Machinery
  - Link-Belt Limited
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Jeffrey Manufacturing Co.
  - Orton & Steinbrenner Co.
- Buckets (Clamshell)
  - Industrial Works
- Buckets, (Grab)
  - Industrial Works
- Building Materials
  - Brantford Sand & Gravel Co.
  - Britnell, Limited
  - Brompton Lumber & Mfg. Co.
  - Link-Belt Limited
  - Muldoon Ltd., J.
  - Oakley & Sons, Geo.
  - Rogers Supply Co.
  - Vitrified Clay Pipe Publicity Bureau
- Building (Steel)
  - Standard Steel Construction Co.
- Cable
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Mussens Limited
  - Standard Underground Cable Co., of Canada Ltd.
- Cars—Steel Body
  - F. H. Hopkins & Co., Ltd.
  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - Canadian Equipment Co.
- Cars Wheels
  - Canada Iron Foundries
- Carrier Systems
  - Jeffrey Manufacturing Co.
  - Link-Belt Limited
- Castings—Grey Iron
  - Canada Iron Foundries
  - Engineering & Machine Works of Canada Ltd.
  - Hepburn, Ltd., John T.
  - Inglis Co., John
- Cement
  - Britnell, Limited
  - Muldoon, Ltd., J.
- Cement Gun
  - Cement Gun Co.
  - F. H. Hopkins & Co., Ltd.
- Cement Hardener
  - Canada Cement Co.
  - Rogers Supply Co.
  - Spielman Agencies Regd.
- Cement Waterproofing
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
- Centrifugal Pumps
  - Canadian Austin Machinery
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
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  - Jeffrey Manufacturing Co.
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  - Summerhays & Co., Wm.
  - Vitrified Clay Pipe Publicity Co., of Canada Ltd.
- Clamshell Buckets
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Orton & Steinbrenner Co.
- Coaches, Passenger
  - Canadian Equipment Co.
- Coal Crushers
  - Inglis Co., John
  - Orton & Steinbrenner Co.
- Coal Handling Apparatus
  - Canadian Austin Machinery
  - Canadian Mead-Morrison Co.
  - General Products Co.
  - Industrial Works
  - Inglis Co., John
  - Koehring Co., of Canada
  - Link-Belt Limited
  - Turnbull & Co., Harvard
- Concrete Block Machinery
  - London Concrete Machry. Co.
- Concrete Carts
  - Canadian Welding Works
  - F. H. Hopkins & Co., Ltd.
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  - Dominion Concrete Company
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  - F. H. Hopkins & Co., Ltd.
  - Koehring Co., of Canada
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- Concrete Mixers and Appliances
  - Canadian Austin Machinery
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - Mussens Limited
  - Turnbull & Co., Harvard
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- Concrete Hardner
  - Spielman Agencies Regd.
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  - Dominion Concrete Company
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  - Winchester Cement Block & Tile Mfg. Co.
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  - Conduits Company, Limited
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  - Vitrified Clay Pipe Publicity Bureau
- Conduits (Wooden Pressure Creosoted
  - Pacific Coast Pipe Co.
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  - Canadian Austin Machinery
  - Erie Steam Shovel Co.
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  - Mussens Limited
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Promise or Performance?

Sometimes promise causes you to buy; but it is performance which finally sells or unsells you on your purchase. Some machines look good on paper but you want yours to make good on the job.

The Thew is an honestly designed, honestly built and honestly sold machine which keeps its promises by its performance. Any owner will confirm this.

George J. Atwell of The George J. Atwell Company, Inc., well known Long Island contractor, knows what performance means. This is what he said:

> "We have one of your shovels now operating on the Flushing Subway Contract and it is doing about 450 yards a day, open cut, loading trucks up on the decking. The cut is 27 feet wide, 12 feet deep, and we find no trouble at all loading from this elevation.
>
> I would suggest that anybody who is looking to purchase a good rugged shovel that has plenty of 'pep' to first get in touch with the Thew Shovel Company before making a purchase."

Don't take his word alone. Go out and look over any Thew and decide for yourself whether there is a better balanced, cleaner cut, surer result getter on any job.

Then write for more information.

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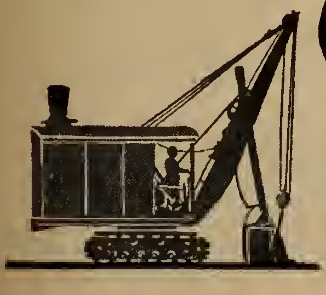
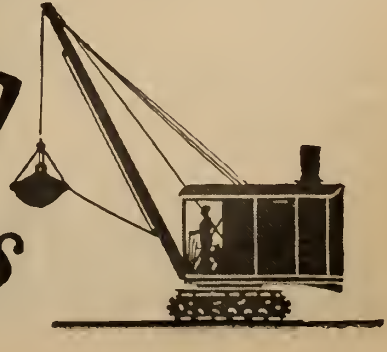
THE WILSON EQUIPMENT COMPANY,
Toronto, Canada.
GORMAN'S, LIMITED,
Calgary, Edmonton, Canada.

T. M. GRINDLEY COMPANY,
1158 Homer St., Vancouver, B. C.
THE EASTERN EQUIPMENT COMPANY
Dorval, Quebec, Canada.



Thew
Power Shovels



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- Otis-Fensom Elevator Co.
- Turnbull Elevator Company

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- Sturtevant, B. F. & Co.

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- Canadian Blower & Forge Co.
- Sturtevant, B. F. & Co.

Fans
- Jeffrey Manufacturing Co.
- Canadian Blower & Forge Co.
- Sturtevant, B. F. & Co.

Fans, Disc
- Canadian Blower & Forge Co.
- Jeffrey Manufacturing Co.
- Sturtevant, B. F. & Co.

Fans, Multiblade
- Canadian Blower & Forge Co.
- Sturtevant, B. F. & Co.

Fans, Propeller
- Canadian Blower & Forge Co.
- Sturtevant, B. F. & Co.

Filters, Water
- Laurie & Lamb

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- McGregor & McIntyre

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- Rawplug Co., of Canada

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- McGregor & McIntyre

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- Imperial Oil Company, Ltd.
- National Fireproofing Co.
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Gantry and Cantilever Cranes
- Orton & Steinbrenner Co.

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- Rogers Supply Co.

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- Kerr Engine Company
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- Canadian Inspection & Testing Laboratories

- Hunt & Co., Robt. W.
- Milton Hersey Company

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- Imperial Oil Company, Ltd.
- Spielman Agencies Regd.
- Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
- Dominion Bridge Co., Ltd.
- Hamilton Bridge Works Co.

Joist Hangers
- Hamilton Bridge Works Co.

Kilns
- Canadian Blower & Forge Co.
- Dominion Bridge Co., Ltd.
- MacKinnon Steel Company

Lead Pencils
- American Lead Pencil Co.

Lime
- Muldoon, Ltd., J.
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Lockers (Clothes)
- Canada Wire & Iron Goods Co.

Locomotive Cranes
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- Canadian Equipment Co.
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- F. H. Hopkins & Co., Ltd.
- Jeffrey Manufacturing Co.
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- Jenkins Bros. Ltd.

Metal Lath
- General Products Co.
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Oil Tanks
- Canadian Des Moines Steel Co.
- Dominion Bridge Co., Ltd.
- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
- Inglis Co., John
- MacKinnon Steel Company

Orange Peel Buckets
- F. H. Hopkins & Co., Ltd.
- Orton & Steinbrenner Co.

Ornamental Iron
- Canada Wire & Irons Goods Co.
- Dennis Wire & Iron Works Co.
- Meldrum Iron Works Ltd.

Ornamental Moulds
- London Concrete Machry. Co.

Paint (Heated Surfaces)
- Barrett Company, Ltd.
- Spielman Agencies Regd.

Paints and Varnishes
- Hopkins & Co., Ltd., F. H.
- Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
- Britnell, Limited
- Dom. Tar & Chemical Co., Ltd.
- Imperial Oil Company, Ltd.
- Spielman Agencies Regd.

Panels (Hardwood & Veneered)
- Laminated Materials

Paving ano Paving Materials
- Barrett Company, Ltd.

- Dom. Tar & Chemical Co., Ltd.
- Imperial Oil Company, Ltd.
- Lumsden Engineering & Contracting Co.
- Standard Lime Co.
- Pacific Coast Pipe Co.
- Vancouver Wood Pipe & Tank Company

Pencils((Lead)
- American Lead Pencil Co.

Penstocks (Wood Stave)
- Hamilton Bridge Works Co.
- Pacific Coast Pipe Co.

Perforated Metals
- Canada Iron & Wire Works
- Greening Wire Co., B.

Pile Driving Machinery
- Canadian Ingersoll-Rand Co.
- Canadian Mead-Morrison Co.
- Clyde Iron Works
- Hopkins & Co., Ltd., F. H.
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Pipe (Concrete, Iron & Wood)
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- Canadian Pipe Co.
- Dominion Concrete Company
- Gartshore, Thompson Pipe Co.
- National Iron Corporation
- Pacific Coast Pipe Co.
- Vancouver Wood Pipe & Tank Co.

Pitch
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Planing Mill Exhausters
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Plaster
- Britnell & Company
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Plastering
- Hynes Co., W. J.

Pneumatic Machinery
- Canadian Ingersoll-Rand Co.
- Laurie & Lamb

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- Jeffrey Manufacturing Co.

Posts (Indicator)
- Jenkins Bros. Ltd.

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Propeller Fans
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Pump Valves
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- Mussens Limited

Rails
- Gartshore, John J.
- Hopkins & Co., Ltd., F. H.
- Mussens Limited

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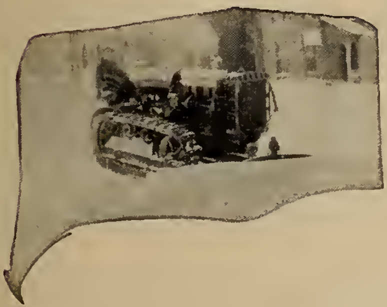
"Economical"

"OUR BEST 'Sixty' has revolutionized our cost of road construction and maintenance," writes the engineer of a Colorado County where the Best has been used for pulling scraper, elevating grader, scarifier and snow plows. "In fact, it has never failed in anything we have asked it to do and has been very economical both as to repairs and operation."

Investigation of the work of Best "Sixties" and "Thirties" on any job will prove worth your while. A list of owners will be sent on request.



SEND for free book which tells how progressive cities are removing snow, and why they find it to their advantage. It's profitable winter work for contracting outfits.

C. L. BEST TRACTOR CO.

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Victoria Square, Montreal, Canada.

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BEST TRACTORS

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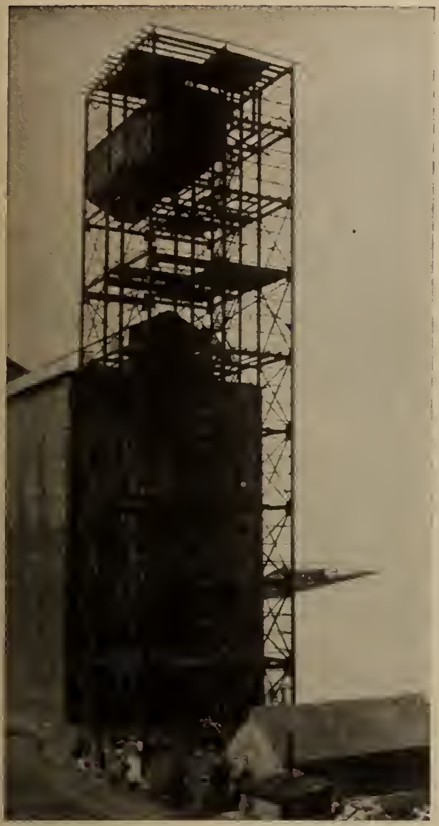

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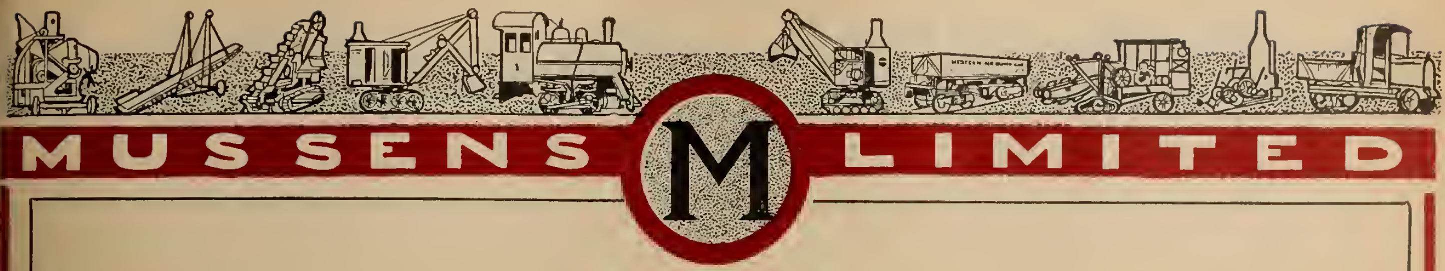

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Who Builds the Best Revolving Shovel MOUNTING

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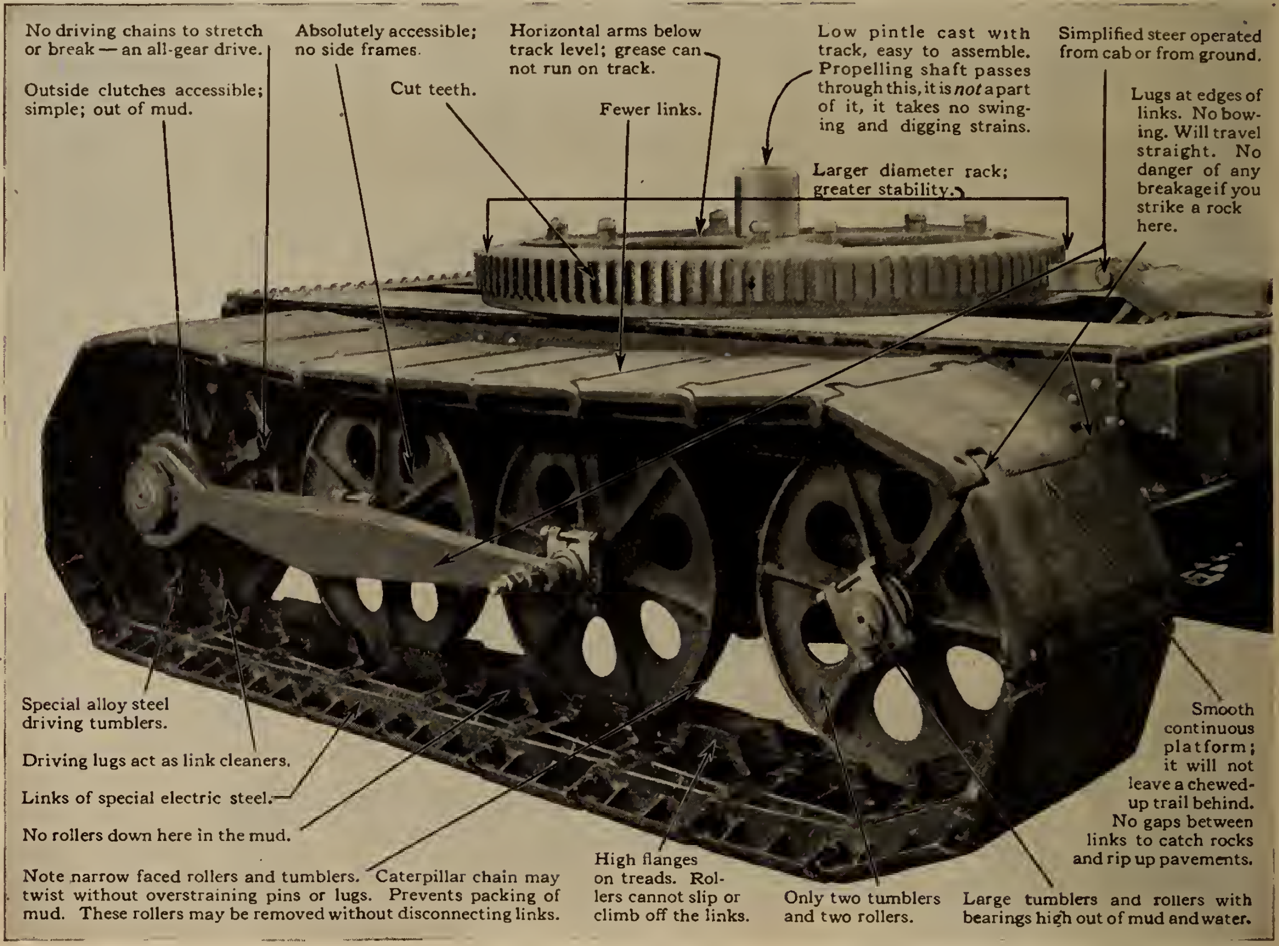

No driving chains to stretch or break — an all-gear drive.

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Horizontal arms below track level; grease can not run on track.

Fewer links.

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Larger diameter rack; greater stability.

Simplified steer operated from cab or from ground.

Lugs at edges of links. No bowing. Will travel straight. No danger of any breakage if you strike a rock here.

Special alloy steel driving tumblers.

Driving lugs act as link cleaners.

Links of special electric steel.

No rollers down here in the mud.

Note narrow faced rollers and tumblers. Caterpillar chain may twist without overstraining pins or lugs. Prevents packing of mud. These rollers may be removed without disconnecting links.

High flanges on treads. Rollers cannot slip or climb off the links.

Only two tumblers and two rollers.

Large tumblers and rollers with bearings high out of mud and water.

Smooth continuous platform; it will not leave a chewed-up trail behind. No gaps between links to catch rocks and rip up pavements.

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20-B—¾-yard. 30-B—1, 1⅛-yard.
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Also as Draglines, Clamshell Excavators, Cranes, Etc.

Send for Bulletin **C-D** and state which size you are interested in.

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LINKS AND PINS are *not* lubricated. Years ago this company abandoned this principle after thorough test had showed it increased rather than decreased wear.

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The following features are found ONLY on Bucyrus Steam Shovels:
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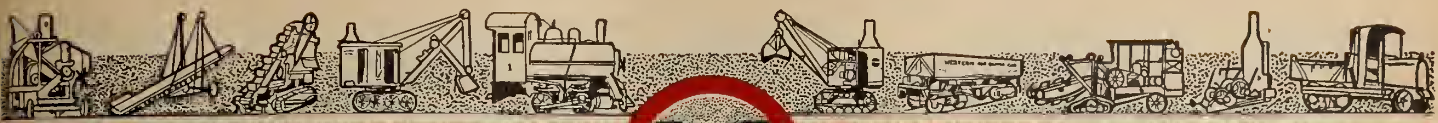

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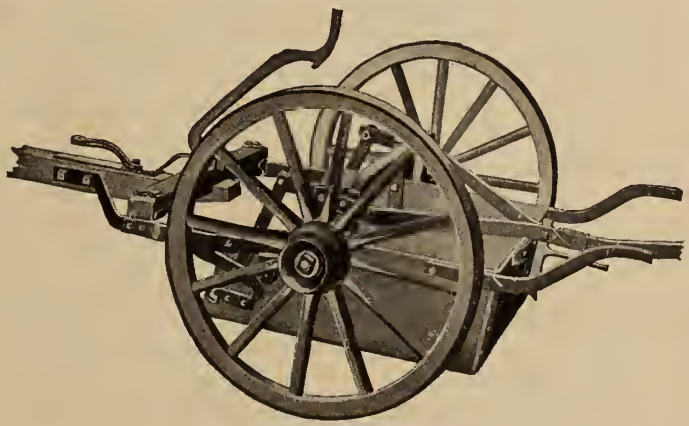

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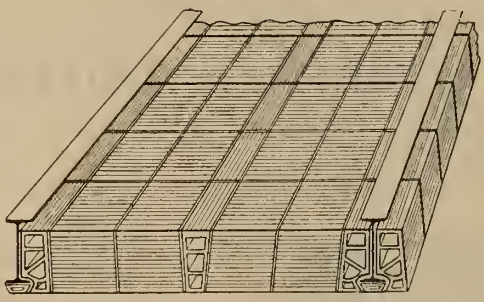

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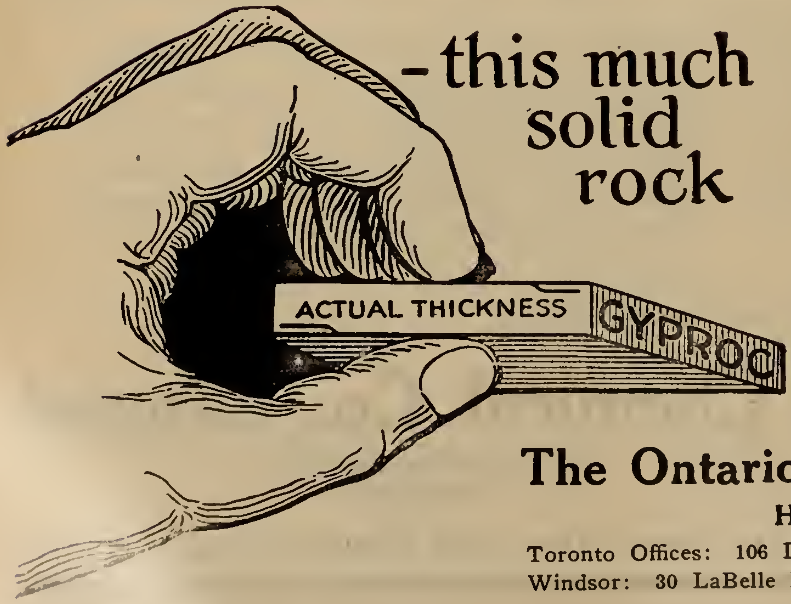

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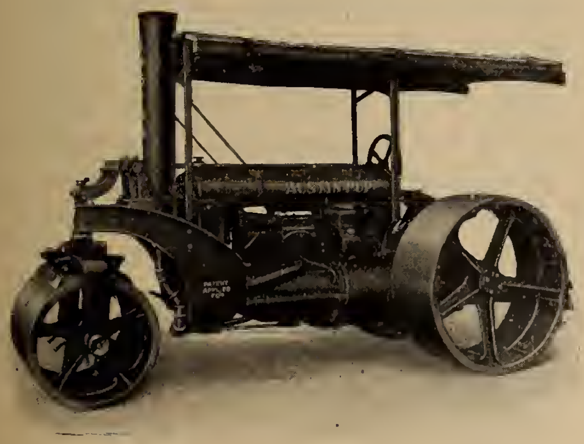

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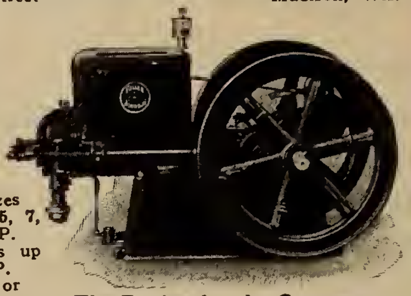

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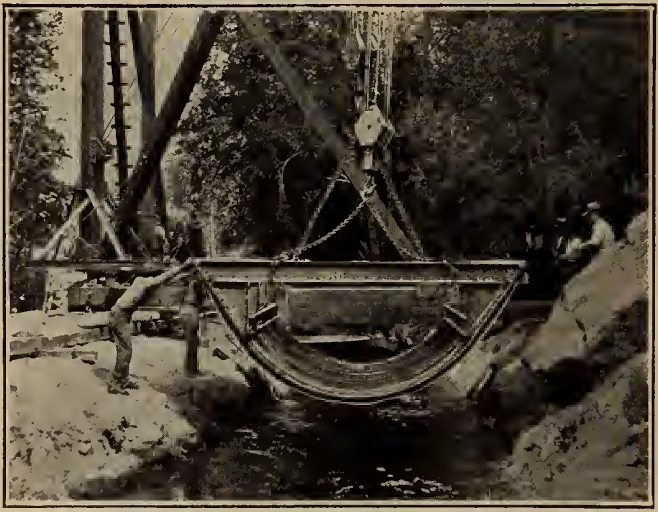

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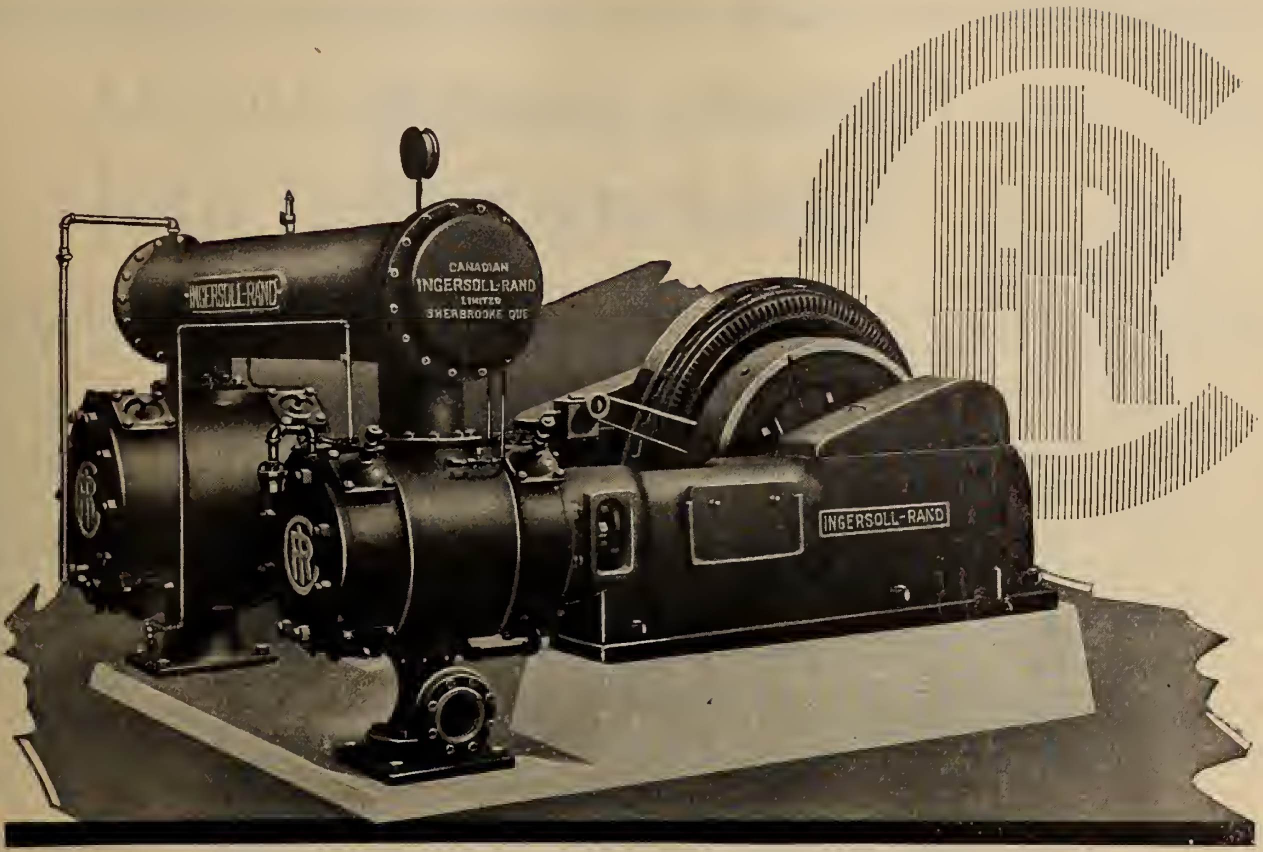

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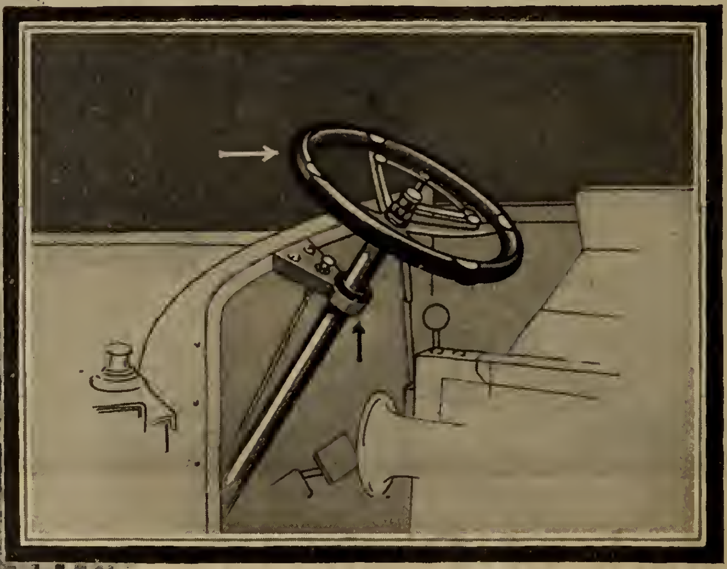

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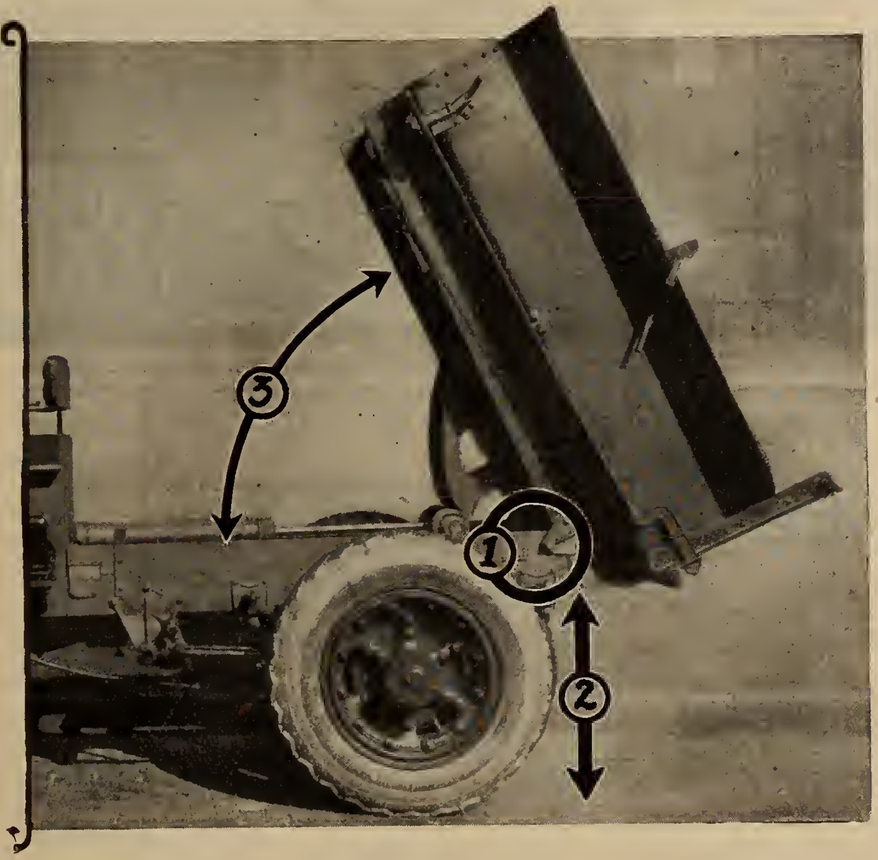

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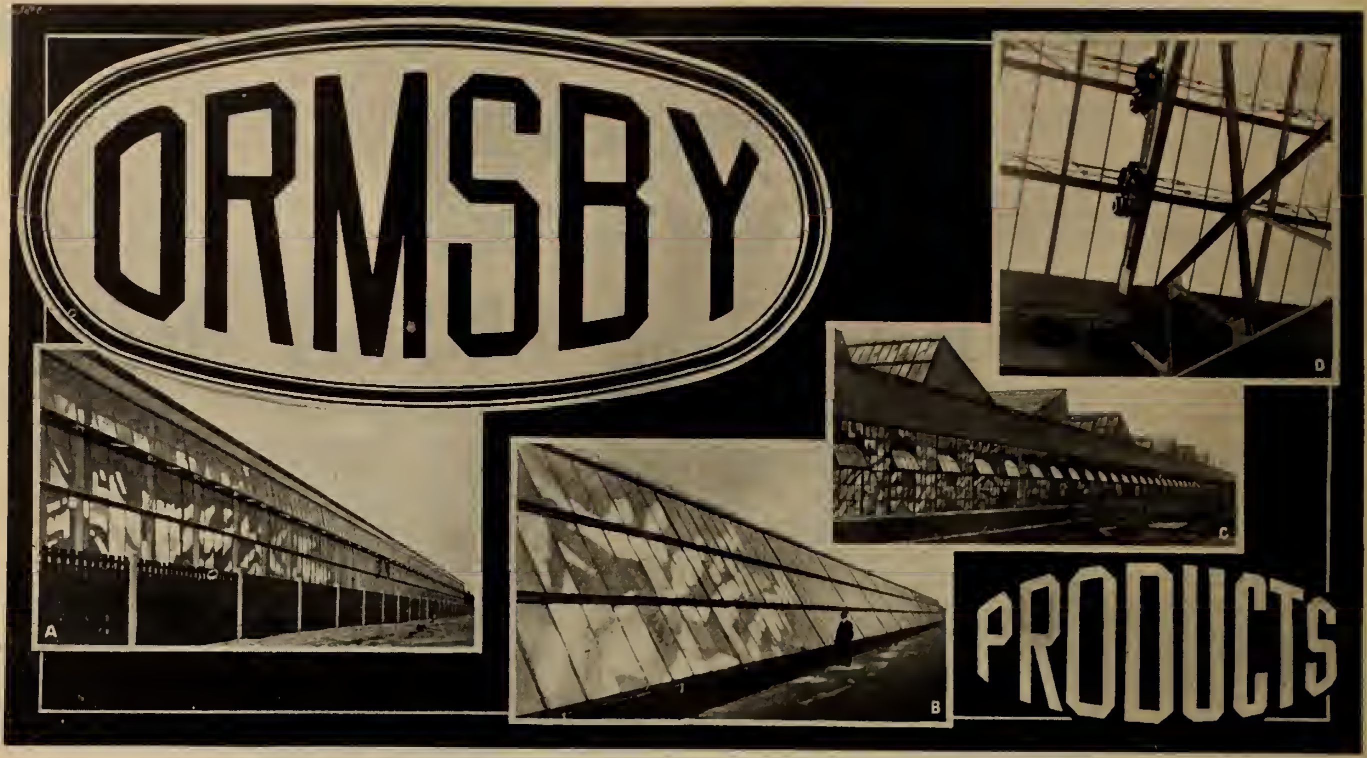

New Ford Plant, Toronto—"A" shows Pond continuous sash covering entire south wall, 3 rows high, each row 348′ x 5¼′—"B" depicts 5280 square feet of Pond continuous sash in one of the six monitors—"C" Continuous run of Ormsby Lupton sidewall sash 440′ long by 10′—3⅛″ high—"D" the heart of the operator, motor driven powers each operating 350 feet of 5 feet high sash.

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Contract Record and Engineering Review

DEVOTED TO CONSTRUCTION AND ENGINEERING

Vol. 37 Toronto, November 14, 1923 No. 46

A Method of Calculating a Fair Rate for the Transportation of Western Coal

By M. J. Butler, C. M. G., M. E. I.C.,
Past president, Engineering Institute of Canada

Is it possible to allocate to freight service the costs per train-mile, as distinguished from passenger service?

Professor William Z. Ripley in Railroad Rates and Regulations, 1923, page 70, states. "So many expenditures are incurred indiscriminately on behalf of the service as a whole, being an indispensable condition for operation of the property at all, that no logical distinction of expenses, even as between passenger and freight traffic is possible."

If this is true and it is usually accepted by authorities, how then are we to say just what rate of freight will prove to be profitable? It seems to show that there is a way whereby we may fairly estimate that if we succeed in earning on new business the average train-mile earnings we shall at least have a rational basis to work with.

There is one measure of effective operation and that is to concentrate in the train load the maximum number of tons that the physical character of the railroad will carry, to provide locomotives powerful enough to haul the heaviest trains, to provide cars of large capacity so as to keep down the dead load to a minimum and run all such trains solid from division point to division point, allocating the engines and cars exclusively to the special business.

To quote from Professor Ripley, page 88: "The train load is generally adopted to-day as the unit of operation, measuring the cost of the service. It is a fact that, within certain limits, the cost of handling a train does not vary greatly with its capacity... Eaton, in his Railroad Operations, concludes that from 30 to 50 per cent of cost is independent of the train load. The effect is that any increment in the paying load very materially decreases the cost of operation per ton."

Potential Long Haul Traffic

We have in the Canadian National Railways a great system, with, at present, insufficient traffic offering to adequately meet the enormous fixed charges. Yet in the province of Alberta there are very large fields of high class coal and in the province of Ontario a market for a very large business—the ideal long haul, that will justify a special equipment, and enable a steady uniform flow of heavy tonnage.

To quote from Professor Ripley, under somewhat similar conditions a rate must be named that will secure the business "and one comfort may be uncovered in so doing. The lowered rate may so stimulate new business and enlarge the volume of traffic, that it may be handled at much lower cost. In fact, this consideration alone in absence of all competition may induce a lowering of rates at certain points out of line with the general schedule. This incentive, conditioned by the fact of increasing returns, is always in the background. The destiny of many places is manifested in terms beyond the control of the carrier. Soil may be poor, climate or population adverse to progress, but some particular places enjoy peculiar advantages for growth. Not to stimulate new business at these points where traffic might be cultivated, even without rivals in the field, is little better than allowing it to escape over a competitor's line of rails, were they present.

"So indisputably has this law, that an expanding volume of business up to a certain point may profitably be carried at a continuously lowered cost, been proved, that it is estimated, by so competent an authority as the Engineering Review, that provided sufficient tonnage be available for 2,000-ton freight train loads, a cost of one mill per ton-mile can be attained.

"This, of course, does not imply that any railroad in actual operation, carrying all kinds of freight including a large proportion of local traffic can in the immediate future hope to attain this result. It is intended only to show that, provided the volume of traffic be large enough, the cost of operation tends to decline as a matter of course, until a congestion for the existing plants has been reached. At this point a new cycle of costs of operations and profits makes its appearance. There is in effect but one principle that actuates traffic officers in naming a rate, and that is, what will the traffic bear?"

The rates quoted by the traffic manager of the Canadian National Railways, Mr. Dalrymple, are prohibitory and evidently were made with the purpose of prohibiting the bringing of Alberta coal to Ontario points. The temporary rates named by Sir Henry Thornton, while reasonable from the experimental standpoint, with the inadequate equipment in use, will not be profitable to the railway.

It would seem to be the part of wisdom to learn what is being done elsewhere in the way of equipment provided, where the conditions are sufficiently parallel, i.e., a larger steady low grade traffic to be moved from point of production, the mines, to the point of shipment, on the lakes or seaboard.

The Great Northern Railroad owns 69 Mallet locomotives. Locomotive No. 2,022 handled a 16,000-ton train of ore over a 114-mile division in six hours and forty-five minutes; grades 0.4 per cent and one grade of 0.6 per cent. The Chesapeake and Ohio, the Norfolk and Western and the Illinois Central Railroad coal roads, are well equipped with Mallet-type locomotives and steel coal cars of 50, 75, 80, 100, and 120-tons capacity. The Virginian Railway Company, a coal road, in 1920 operating 523,57 miles of road, hauled 100 and 120-ton cars of coal from Princeton, West Virginia to Roanoke, Virginia. The standard train is 8,500 tons of mixed cars, but the grades, with the locomotives owned, can handle 15,000 tons when sufficient empty and load brakes are available to get them down a 1.5 per cent grade. They have fourteen miles of 0.6 per cent grades against the loaded movement over the Allegheny mountains. The maximum grade, other than this, in the direction of loaded traffic is 0.2 per cent. They have two sections of 1.5 per cent grade, one eight miles in length, and one eleven miles in length in the direction of the empty movements. Rolling stock owned to handle the freight consists of the following:

Consolidation,	2-8	tractive power,	29,400 lb. each	8
Mikado, M.A.,	2-8-2	tractive power,	45,200 lb. each	6
Mikado, M.B.,	2-8-2	tractive power,	56,000 lb. each	42
Mikado, M.C.,	2-8-2	tractive power,	60,800 lb. each	18
Mallett, A.A.,	2-6-6	tractive power,	70,800 lb. each	4
Mallett, A.C.,	2-6-6	tractive power,	90,000 lb. each	8
Mallett, A.B.,	2-8-8-2	tractive power,	97,400 lb. each	1
Mallett, A.D.,	2-8-8-2	tractive power,	115,000 lb. each	6
Mallett, U.S.,	2-8-8-2	tractive power,	101,250 lb. each	20
Mallett, A.E.,	2-10-10-2	tractive power,	147,200 lb. each	10
Triplex,	2-8-8-8-4	tractive power,	166,300 lb. each	1

Cars in freight service are as follows:

Box, capacity	80,000 lb	536
Stock, capacity	80,000 lb	848
Flat, capacity	80,000 lb	186
Flat bottom gondolas	218,000 lb	574
Flat bottom gondolas	105,000 lb	2,985
Hopper coal	100,000 lb	148
Hopper steel coal	105,000 lb	2,176
Hopper steel coal	110,000 lb	999
Flat bottom steel coal	110,000 lb	993
Total		7,875

Capacity, December 31, 1920, 512,330 tons.

The quantity of coal handled in the year was: anthracite, 9,686 tons; bituminous, 7,145,731 tons.

Mileage of loaded freight cars north and east	53,126,394
Mileage of loaded freight cars south and west	2,583,540
Mileage of empty freight cars north and east	415,944
Mileage of empty freight cars south and west	50,895,227

This shows a practically one-way load with returned empties.

The approximate distance from Alberta coal fields to Toronto, all rail, is 2,500 miles, according to the evidence of Mr. Mallory given before the House of Commons Committee. The average length of division on the National Railways is 137.5 miles. Good practice shows that solid through trains may be safely run through two divisions per day, or 275 miles, at an average speed of fifteen miles per hour, changing crews only at divisional points. The time the train is in motion is say, eighteen hours; number of divisions, sixteen; total time required for such a train, one hundred and forty-four hours. Twelve hours may be added for incidentals, making one hundred and fifty-six hours from coal spur to a Toronto yard.

To start with, two trains per day would be the minimum business that would fairly test out the possibility of a profitable business. What equipment would be required for a service of two trains per day? With sixteen divisions to cover, two trains per day, sixty-four locomotives would be required. As locomotives must be shopped for repairs from time to time an addition must be made of say six, making seventy locomotives to be provided of the 2-8-8-2-class with a tractive power of 101,250 pounds each. Allowing sixteen pounds per ton to cover resistance of train load, this type of engine would handle a gross train load of 6,300 tons. If seventy-five ton coal cars are used, the dead weight of the car is 32.5 tons and the weight of car loaded is 107.5 tons each. Therefore, the train would comprise fifty-eight cars, with a tonnage of 4,350 tons of coal.

Haulage Costs

The gross earnings per train-mile necessary to be had in order that the business may be profitable to the railway should be about five dollars per train-mile, hence we get, allowing 5,000 train-miles per 4,350 tons of coal, an average price or cost of $5.75 per ton.

If, however, the railway company seeks to carry on this business using the Mikado type locomotives with an average tractive power of 60,800 lb. and with fifty-ton coal cars, the gross weight of the train would be 3,800 tons, or say fifty-three cars, and 2,650 tons of coal, and the cost would be, on the same basis, $9.43 per ton.

It will be necessary to provide, to handle two trains per day using seventy-five-ton cars, the following:

2,000 cars at a cost of $4,000 each, or	$ 8,000,000
64/2-8-8-2 Mallet locomotives at $90,000 each	$ 5,760,000
Total equipment	$13,760,000

The necessary vans, it is assumed, are already available.

A total of 8,700 tons of coal per day would be delivered in the Toronto district and not less than three hundred days per year would be devoted to it, thus bringing forward 2,610,000 tons of coal. Needless to remark, the coal to bear so heavy a transportation charge must be of the best quality and compare favorably with the best anthracite coal on the market, and the price at the mines f.o.b. cars, must be on an economical basis, comparable with Pennsylvania mining costs.

The hauling capacity of this type of Mallet locomotive, west-bound, allowing resistance of twenty pounds per ton would be 5,000 tons; the weight of the returning empties would be about 1,900 tons. It would therefore be practicable to add a considerable number of loaded cars to the extent of limiting the length of train that could be safely handled through the passing tracks, yards, etc., thereby reducing the cost per ton of coal by the amount thus earned.

The above paper was presented before the Toronto Branch of the Engineering Institute of Canada on Thursday, Nov. 8.

A joint meeting of the Associated General Contractors and the American Road Builders' Association will be held in Chicago on Thursday, January 17, 1924, to discuss various matters of importance to the membership of both organizations. This joint meeting has been made possible by the proximity in dates of the annual meetings of these organizations in Chicago. The 1924 convention of the American Road Builders' Association will be held Tuesday, January 15th, to Friday, January 18th, inclusive, while the Associated General Contractors meet the following Monday, Tuesday and Wednesday.

Is There Danger in Separate Contracts?

Is the General Contractor's Function Misunderstood?

Study Made by Associated General Contractors Argues that Separate Tenders for Mechanical Trades Would Undermine Construction

The direct awarding of contracts for heating, ventilating, plumbing and electrical work to sub-contractors means that certain integral portions of the structure upon which other integral portions depend in both structural feature and sequence of installation are to be removed from the co-ordinating control of a centralized management, and that these portions are to be placed under the control of an agency that assumes no responsibility for cost or time of completion, namely, an architect, an engineer or a contracting officer.

The importance of the question at issue, with respect to sucessful construction performance and responsible service can hardly be overstated, but it is difficult for those unacquainted with the business side of construction to anticipate the results that a change of policy affecting usual contractural obligations may entail. To do so it is essential that the system of executing construction projects through the agency of a general contractor be clearly viewed and that cognizance be taken of the service which the general construction company performs. For this reason a section of this analysis is given to a statement of the service performed by such a company, after which is stated the effects that may logically be expected to result from altering the character of this service by the use of separate contracts for mechanical equipment.

Management Function of the General Contractor

The principal function of a general contractor, when operating under the single contract plan, which has developed to meet the needs experienced by both public and private owners, consists of furnishing centralized construction management and single responsibility for successful completion of a structure. The element of responsibility is manifold and under most existing contracts includes protection to the owner from loss due to causes such as the following:

Increased cost of construction.
Delay in completion.
Injury to workmen and the public.
Patent infringement.
Injury to adjacent property.
Damage from the elements and acts of God.
Imperfect material and workmanship.
Liens and the abuse of lien laws.
Default on subordinate contracts.
Unknown underground conditions.
Demands for extortionate wages.
Fire and theft.
Labor, material and transportation shortage.

When separate contracts are used, much of this responsibility is placed directly upon the owner. Contrary to popular conception, the most important function of the general contractor is not to erect steel, brick or concrete, but to exercise skill in purchasing, to co-ordinate all crafts as to structural feature, and to synchronize their operations as to time of installation. Due to the great number of different trades and products entering into a project, all of which must be co-ordinated with the main skeleton and principal elements, this portion of the work is usually performed by the contractors' own forces—not that actual performance of such work is in inseparable from the management function, but because it is the most vital portion of the structure, into which other elements fit, and should therefore be subject as far as possible to control of the central management.

General contracting in construction today is a combination of management service, financing, and the assumption of certain risks which are not common to manufacturing and other industries. In fact, the basic industries serving construction refuse to accept many of these risks; and since the public or private owner is unwilling to assume them, they are consolidated and carried by the general contractor as a part of his service. Incidentally, it is that part of his service which has made contracting the most hazardous of all production industries.

General Contractor Gives Protection

More briefly stated, the construction company guarantees to deliver a specified project at a given cost and sometimes at a given time. Under a policy of separate contracts certain portions of the work would be taken away from the construction company's control, but apparently that company would be responsible for the time of completion and satisfactory coordination of the different crafts.

A few public officials and practicing professional men have tried the plan of making separate contracts for all portions of a building, thus eliminating the services of a general contractor, but these experiments have demonstrated conclusively that though the contractor may be eliminated as a personality, his business function must be assumed by either the owner or his representatives, and, assumed moreover, without the protection against those contingencies assumed by a general construction company. In other words, general contracting is not the mere broking of contracts, but is a highly specialized business, depending for its success upon the personal skill and direction of capable executives.

In a comparatively few exceptional cases, engineers or architects have successfully performed this management function; but they have done so not by reason of their technical skill, but in spite of it. They were good construction executives, with an understanding of business and economics—a combination

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Brief prepared by Ward P. Christie, research engineer, Associated General Contractors of America.

not commonly found in the professions. The award of separate contracts constitutes the assumption of construction management by the professional representative of the owner and is subject to the same objections that are encountered when the construction executive attempts the function of design. Each of these functions requires its particular type of mind, trained to its respective functions, and when either transgresses the other field the owner usually pays the unnecessary cost.

Sub-contractors undoubtedly understand this question of management, and the issue of separate contracts involves no contention that the management function can be eliminated but merely raises the contention that this management shall be split apart and a portion of it placed upon the owner or his representative—a procedure which under usual conditions the vast majority of conscientious professional men know to be unsound.

Since delay of completion and extra cost are serious factors in most construction projects, and since owners naturally do not care to assume direction of matters affecting these things, they have nearly always found it to their best interests to deal with a single responsible company that will guarantee to deliver the structure at a given time for a given price, without obliging them to assume the task of management. Such a service can obviously be rendered only through the award of a general contract which vests in some experienced company the authority necessary to carry out the commission. That this policy of management is sound in practice as well as theory is demonstrated by its continuance in an economic scheme where the general contractor as an individual has successfully dealt for his client with a multitude of strongly organized industries.

Effect on Cost

The inconsistency of the separate contract plan, though obvious with respect to the time element, is not so apparent with respect to cost. Yet its effect on cost is the same. Any delay of a project under ordinary circumstances adds to the cost, and with four or five independent contractors carrying on their respective operations, delays in those contracts introduce delays and expense beyond the control of the principal contractor. In view of the principle of extension of time for delays beyond the control of the general contractor, any award of separate contracts upon which the major contract depends appears incompatible with the spirit of the new standard contract.

In practical effect, separate contracts mean the shifting of control without the shifting of responsibility, a process that corporate industries constantly guard against. In fact, the necessity of matching responsibility with control is so generally accepted in modern industry that the principle has become axiomatic. Under the separate award a portion of this control is placed in the hands of a professional man or, on government work, in the hands of a contracting officer, neither of whom assumes financial responsibility to the owner. Since it is upon this responsibility that competitive bidding is established, public officials and the professions should proceed with caution, unless they desire to pave the way for a breakdown of the competitive system.

Reports from many representative construction companies show that the usual percentage commonly, but improperly, designated as profit that is added to mechanical contracts by the general contractor is about 5 per cent. This amount, though it may, in some cases, contain an element of profit, is in reality a service charge to compensate for such items as superintendent, night watchman, hoisting, storage space, protection from weather, temporary heating and other general overhead expense entailed by the sub-contractor which cannot be accurately proportioned to each unit of construction. When it is recalled that the architect in private work usually charges 3 or 4 per cent. for handling sub-contracts direct and yet provides none of the above items except the superintendent, it is obvious that the contractor's 5 per cent. can contain no great amount of profit.

As the total proportion of the mechanical trade is rarely over 20 per cent. of the project, it therefore occurs that the architect's fee for management amounts to some three-fourths of 1 per cent. and the contractor's fee to about 1 per cent. of the total contract sum. On government work this fee of the architect would not actually be paid in money, but if the supervising architect or any other official performs this management function his staff must be greater than that required for design and the added expense occurs. This means therefore that by using separate contracts a private owner of the government appears to save one-fourth of 1 per cent. on the structure by assuming the responsibility that is regularly assumed by the general contractor.

In reality the saving is less than this amount, as the architect and the contracting officer have no facilities for rendering the necessary services to sub-contractors and must in their contracts place performance of this service upon the general contractor. The expenses for such services must obviously be included in the general contract price, if they are not included in their logical place as a percentage on the sub-contract.

Indirect Expense Offsets Apparent Savings

Experience has shown that this apparent saving on the contractors' charge, due to at least four factors of indirect expense which overbalance the saving, is seldom realized. These are as follows:

1. Suits and Damages. When the responsibility for successful performance is divided among a number of independent contractors, friction almost invariably arises over their respective obligations and the way is open to claims for extras and damage. That the danger discord and damages under the separate contracts plan is anticipated and may be a very grave reality, is evidenced by the Standard Documents of the American Institute of Architects. Provision is therein made that if any contractor damages another he shall settle with that contractor if the contractor will agree to settle, and if any contractor sues the owner by reason of such damage, the contractor alleged to be responsible for the damage shall defend the suit at the owner's expense, reimbursing the owner if the suit is lost.

The mere fact that the system places an owner liable to such suits is a contingency which careful owners may well consider. In the case of government work the liability may not be so great, but cognizance should be taken of the fact that any policy approved by the government will be used as a precedent for urging that policy upon unprotected individuals.

2. Competitive Prices. It is common knowledge that general contractors usually receive lower bids from the mechanical trades than do individual owners dealing directly, and there is little reason to believe that the government will fare better than the individual. Where the general contractor is used moreover, the government receives a double competition: First, the competition of sub-contractors dealing with the general contractors and, second, competition between general contractors. Frequently it occurs that the general contractor, considering a proposal from the mechanical trades excessive, substitutes his own figures and brings the cost of the work within them. Though he does not pretend to know the technique of mechanical design, any more than the technique of cement manufacture, he has a good idea of quality, price and co-ordination of such work with the whole and uses this knowledge as a part of his service to the owner.

3. Delay Contingency. As government contracts carry liquidated damages for delay in the date of completion, it is logical to assume that the government is subject to loss when the stipulated time is overrun. Under the separate contract plan the probabilities of over-running the time are exceedingly great, and if the general contractor is held responsible for that time he must unquestionably include in his bid an allowance to cover such a contingency. If the time is not over-run the government receives no liquidated damages, but it has paid insurance against it.

4. Overhead Costs. One of the basic reasons for the consolidation of independent establishments into large corporations and chain stores is the reduction of indirect and overhead expense entailed by the isolated units, and the same principle applies to construction. Four or five independent contractors, establishing their operations independently, possibly erecting separate hoists, or otherwise duplicating certain common functions unquestionably carry a greater overhead expense than when all operations are co-ordinated under a single head. This duplication of overhead invariably exists under such arrangement and owners are obliged to foot the bill.

Quality of Construction

The quality of construction obtained under one or the other systems of contracting need not be influenced materially by the system itself, as the supervising agency has authority to reject portions of the structure that are unproperly constructed or contain faulty materials. Under the single contract plan, however, the general contractor naturally exercises precaution to insure that the work is properly installed as he, in the final analysis, stands responsible for its quality and guarantees that all portions of the structure will be constructed as specified.

That the architect in private work not only values this inspection and supervision of the general contractor when separate contracts are used, but also forces him to exercise it, is indicated by the standard contract of the American Institute of Architects, which provides for either plan.

Article 41 reads, "If any part of the contractor's work depends for proper execution or results upon the work of any other contractor, the contractor shall inspect and promptly report to the architect any defects in such work that render it unsuitable for such proper execution and results. His failure so to inspect and report shall constitute an acceptance of the other contractors' work as fit and proper for the reception of his work, except as to defects which may develop in the other contractor's work after the execution of his work."

Must Stand Sponsor

This paragraph means that the general contractor, even though he has had no supervision of installations under the separate contract, must nevertheless stand sponsor for its quality. This, the mechanical trades contend, he is not competent to do, and upon this contention base their principal argument for the separate contract. It appears that regardless of the number of different contracts involved, the general contractor is asked to stand sponsor for the entire work. To do so without having control of the work is nothing short of a gamble; and when architects and public officials force the contractor to gamble, they can logically expect the latter to cover himself with a contingent charge.

The contract clause quoted above is obviously the result of difficulties that have arisen under the separate contracts system and if there is any preference between the two systems with respect to quality and workmanship, it undoubtedly rests with the single contract and centralized responsibility.

Satisfactory construction service requires not only that a structure be properly built, but also that it be delivered when due, and a delay in one separate contract may delay the progress of the entire project. The heating plant is essential to the drying of walls and the execution of certain other work. Plaster, marble, tile, and painting are also dependent upon the heating plant, and if it is not installed at the proper time the owner does not get his project when due.

Friction and Shifting of Responsibility

Friction between superintendents of the different contractors is almost inevitable, since the work of each appears to depend upon the performance of another. Issues arise over the use of hoists, the laying out of conduits, storage of materials, the installation of safety devices and numerous other matters inevitable when a dozen or more crafts are working together. Under such conditions it is hardly conceivable that efficient construction service can be rendered without the presence of a central management, financially responsible for its acts.

With a number of independent companies operating on a building, responsibility is easily shifted until it is practically impossible to determine who is responsible for the commission of various acts. Obviously the type of construction service desired by client owners cannot be supplied efficiently unless some responsible agency has control of every element involved.

Claim has been made by individual engineers and architects from time to time that by supplying management service they eliminate the general contractor and save their client his profit. Such contentions are untenable in view of the actual personal service that must be rendered in the erection of a structure. They do not eliminate the contractor, but merely become a contractor, operating on a cost-plus basis, minus the element of financial responsibility. It is from a portion of this "plus" that the competitive bidder draws his profit.

The breaking down of a general contract into separate divisions is a step toward shifting management from a financially interested competitive bidder to the professional man whose ethics preclude financial competition. If carried far enough it must certainly lead to the elimination of commercial competition, in so far as guaranteed cost of construction projects is concerned.

An important service of the general contractor consists in assuming the responsibility for liens. It is an inconvenience to the owner to have to investigate the wind-up of four or five contracts to protect himself from liens when this protection can be given by a single individual. It is partly for this reason that leading bonding companies prefer a general contractor in control of the entire project and that mortgage and loan associations prefer loaning money on those projects under the management of a general contractor.

On a construction project the accident frequency requires that special care be taken by some responsible head to protect the entire working force from accident. Under many laws the injured employee may sue the owner in conjunction with the contractor where violation of safety requirements are found, and if the contractor is not good under judgment, can recover from the owner. Here again enters the question of responsibility for safety devices, which under separate contracts can easily be shifted, placing final responsibility upon the owner. The same situation is true with respect to injury of the public, where again the assumption of all responsibility by a general contractor is a protection to the owner.

How Can Painting Costs Be Reduced?

Use of Modern Air Brush Cuts the Total Cost of the Work in Half—Quicker Application, No Waste, Greater Thoroughness—Comparative Figures

By Howard W. Beach in "Compressed Air Magazine"

How many manufacturers realize that the cost of paint represents less than one-third the cost of painting when the paint is applied by hand-brush workers? Records made of a typical case of painting a plant by the hand-brush method reveal that $4,200 was spent for labor to apply paint costing $1,800, or $2 for labor for every dollar paid for paint. This is a fair case. In ordinary factory maintenance, $4, $5, or $6 are not infrequently expended for labor to apply a dollar's worth of paint.

One way to save is to use good paint. The better the paint the longer the interval between painting—hence a lower outlay per year of service. On the other hand, supposing paint to cost nothing at all, the labor charge to brush the paint on by hand would still loom large on the books. Logically, therefore, men responsible for maintenance sought a new and better method of application, inasmuch as application was the item that represented the principal part of the cost of painting. As a result, the air brush is now widely used for factory, mill, and industrial plant painting, both exterior and interior.

What does the air brush accomplish? "A week's work in a day,' as demonstrated by actual performances. In other words, a surface that it takes a hand-brush worker a week to cover can be painted in one day by an air-brush operator! A similar but much larger plant than the one referred to in the beginning of the article was painted recently by air brush. The costs were: $4,000 for paint and $1,800 for labor. Compared with the first example, air-brush application here saved over 50 per cent. of the cost of painting. Labor saving, great as it is, however, is not the only advantage of air-brush painting. Speed, cost of scaffolding, accident prevention, ability to reach surfaces inaccessible to the hand brush, are other important features. For instance, it is sometimes just as necessary to make speed as it is to save money. Air-brush application, as has been emphasized, takes but a fraction of the time required to do the same amount of work by hand brush. Recently the exterior of a good-sized plant was both cleaned and painted by air in 100 man-days as against the 500 days estimated for hand-brush work. The low-pressure air brush applies paint at hand-brush consistency without special thinning, hence a dense and elastic coat is obtained. More paint may be put on at one application by air than by hand. On inside work, one coat applied by air can, therefore, be made to equal a two-coat, hand-brushed job, while on outside work two air-brushed coats equal three hand-brushed ones. These factors are important in reckoning both cost and speed of painting.

Obviously, "over-the-week-end" painting is desired in most factories. It is clear from the foregoing that the air brush is an adept Saturday to Monday worker. The entire interior of a good-sized building can be painted in this interval by two operators working one air brush in shifts. A larger plant may be divided into convenient sections. By painting one of these at a time the whole plant may be gone over in a few weeks without a single interruption during manufacturing hours.

No Waste of Paint

Materials, parts, and finished products must not be damaged by spattering paint. Where paint is dipped out of a can by brush, drop cloths must be rigged up for protection. With the air brush the operator's entire attention is given to the application of the paint. He does not have to bend, fill his brush, and swing it over his head. The spray of paint, issuing from a low-pressure air brush, is under his complete control; and all the paint goes on the surface to be covered. Drippings and objectionable fumes are eliminated. Strange as it may seem to those that have done home painting jobs, and that have wondered at the amount of paint that was spattered on clothes and on floors, entire plant interiors have been painted by air brush without drop-cloth protection and without the slightest damage to materials lying directly beneath the painted surfaces.

Scaffolding is another item in the cost of painting. The air brush, because of its wider range, materially reduces the amount of work that must be done from scaffolding and even from ladders. Where ladders or scaffolding are necessary, the air brush diminishes the hazard of falling. The operator has only the "gun" to handle and is not bothered with the open paint pot or the constant dipping of the brush. The physical effort is less with the gun than with a bristle brush, as the operator does not have to wipe out or spread the paint. One large works, in figuring estimates for painting, allowed $10,000 for probable claims arising from scaffold falls, based on past experience with hand-brush workers. The job, however, was done by air brush without a single accident of that kind.

The saving in dollars and cents effected with the air brush has been indicated by the facts presented. But there is still another side to the question. Plants which own an air-brush equipment seem automatically to "spruce up."

More Frequent Painting

The paint-maker's famous slogan, "Save the surface and you save all," is a good one but it tells only half the story. Preservation is one thing, but, nowadays, owners and manufacturers do not paint for preservation alone. Plants are kept freshly and brightly painted for the effect on the morale of the employees. Paint is used to create better lighting and thus to increase production and to decrease spoilage. Actual production increases of 10 to 12 per cent. are common after a factory interior has been painted with a proper regard to lighting values. White paint reduces electric light bills.

Paint is also used for its sanitary value. One paint manufacturer has demonstrated that it pays to paint white spots in the corners of floors. Workmen won't spit on white paint. In short, there are a hundred and one important uses for paint in industry. With the air brush, the work is handled quickly and cheaply. The cost of the paint is practically the only item of expense to be considered because the maintenance department can usually swing the job of painting so that it can be done on slack days. As a result, painting is made short work of where ordinarily it would be neglected.

An air brush may be bought originally to lessen the difference between the cost of paint and the cost of painting; but, once utilized, the air brush soon becomes a regularly employed maintenance tool that makes any plant a better place to be in physically, mentally, and morally.

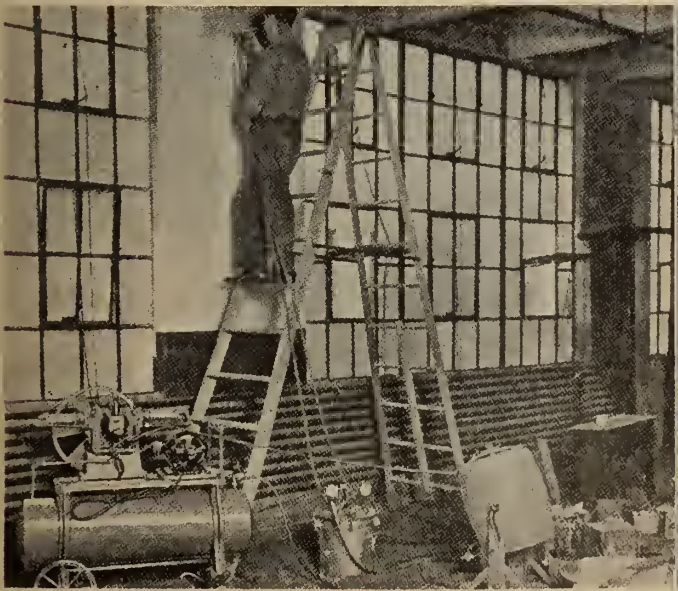
For Metal Protective Coatings

Another use of the air brush or paint-spraying machine is in the economical application of metal protective coatings. Asphalt and graphite paints, iron oxides, and 20 and 25-pound red lead can all be applied at hand-brushing consistency and, latterly, it has also been feasible to spread an oil preparation or rustproofing compound in the same manner. The fatigue that is felt by the painter when applying red lead in the old way is eliminated by the air brush, and it also enables the operator to put on a more even coat and to better protect seams, rivet heads, etc., because of the penetrating force given the paint by the air impulse.

The use of compressed air for painting is not confined to heavy, rough work. At the present time, automobiles are being finished at the factory from undercoaters on through to color varnishes; and even the finishing varnish is being applied by air. A great many plants have recently sprung up where automobiles are being refinished in practically the same way. In some of these small refinishing shops, lacquers are being employed; and the owner of an automobile is now no longer deprived of his car for five or six weeks. As a matter of fact, it is possible to entirely refinish a motor car in not exceeding a week's time. The completely hand-brushed product is today an exception.

Furniture of every description, from the cheaper grades on through to the very finest, are finished by the air-brush method. Shellacs and varnishes, stains, enamels, etc., are all applied by means of compressed air; and the results are better than those obtained by the use of the hand brush.

The principle involved in applying paints, enamels, japans, lacquers, etc., by the aid of compressed air is also being utilized to spray silicate of soda, paraffin, waterproofing oils, etc. While the application of materials by compressed air is in its infancy, great strides in the art have been made in the last few



Brightening up the interior of a shop with a coat of mill white applied quickly and efficiently by means of a portable air-brush outfit

A complete spray-painting equipment. The operator uses a protecting shield to preserve the line between the lower dark and the white sections of the concrete wall years; and the chances for its future development look particularly promising.

Engineer's Comparative Cost Figures on Large Work

Cost per 100 sq. ft. ceiling—air brush

Labor	$1.05
Material	1.00
Power	.03
Depreciation	.005
	$2.085

Cost per 100 sq. ft ceiling—hand brush

Labor	$2.62
Material	1.10
	$3.72

Painting wall, no scaffold, 100 sq. ft.—air brush

Labor	$ .30
Material	1.00
Power	.03
Depreciation	.005
	$1.335

Painting wall, no scaffold, 100 sq. ft.—hand brush

Labor	$1.20
Material	1.10
	$2.30

Babcock-Wilcox and Goldie-McCulloch Interests Amalgamate

It is announced that a new Canadian company having the name Babcock-Wilcox and Goldie-McCulloch, Limited, has been organized to include Babcock & Wilcox, Limited, of London, Eng., Goldie & McCulloch Co., Limited of Galt, Ont., and Babcock & Wilcox Company, of New York. The head office of the new company will be in Galt. The capital is three million dollars, and there will be branch offices in Vancouver, Winnipeg, Toronto, Montreal, and the Maritime provinces. The president of the new company is R. O. McCulloch; vice-president, A. R. Goldie, and secretary, Alex. C. Fleming. The chairman of the board of directors is A. G. Pratt, of New York, and the other directors include Sir James Kemnal, managing director of Babcock & Wilcox, Limited London.; W. D. Hoxie, president of Babcock & Wilcox Company, New York; E. H. Wells, chairman of the board of the Babcock & Wilcox Company of New York, and A. W. Atwater, K.C., of Montreal.

The new company has acquired the Canadian business of Babcock & Wilcox Company, Limited, and of the Goldie & McCulloch Co. Ltd., with the exception of the vault, safe, and safety deposit manufacturing business of the latter company. The new company will continue the manufacturing of boilers, superheaters, economizers, stokers, boiler accessories, engines, pumps, turbines, condensers, etc. Goldie & McCulloch Company, Ltd., will continue the manufacture of vaults, safes, and safety deposit boxes.

The Goldie & McCulloch business was started in 1859 by the late John Goldie and the late Hugh McCulloch. It was incorporated in 1891 with Hugh McCulloch as president and John Goldie as manager. In 1910, Hugh McCulloch Jr. became president and at his death in 1917 was succeeded by R. O. McCulloch. John Goldie, in 1896, was succeeded by his son A. R. Goldie, who now becomes the vice-president of the new organization.

No. 107

Canada's Engineers—S. A. Saylor

S. A. Saylor, who performs the duties of town engineer of Kenora, Ont., is an engineer of the practical variety. While he entered the School of Practical Science, Toronto in 1904 he did not complete his course but proceeded to acquire a practical training that has served him in good stead. Thus in 1907 and 1908 he was with the Rogers Electric Co. as a journeyman wireman in Toronto and London. He then became a stationary engineer with the Bloomfield Canning Co., Bloomfield, Ont., afterwards going to Kenora with the Maple Leaf Milling Co., where he remained seven years as superintendent of electrical, steam and hydraulic equipment. For the past seven years he has been with the Corporation of the town of Kenora as manager of public utilities and public works. The Corporation owned and operated light, water and telephone utilities until the present year when the Hydro-electric power plant was sold to the Backus interests.

Mr. Saylor has also looked after the electrical inspections for the Hydro-electric Power Commission of Ontario, during the past six years. He is a member of the executive of the Association of Municipal Electrical Utilities and district director for the Northern district.

Mr. S. A. Saylor

The Bio-Aeration of Sewage

The Development of the Practice of Purifying Sewage by Aerating Methods—The Biological Significance of the Process—Practical Considerations

By ARTHUR JOHN MARTIN

Before the Institution of Civil Engineers

Ten years ago the design of sewage purification works appeared to be more or less standardized. A strong Royal Commission had carried out an exhaustive investigation, extending over many years; and their recommendations were generally adopted as a basis for the design of works of sewage disposal. While the commission was still sitting a new process of sewage purification had made its appearance, which bids fair to supersede some of the methods now in use. Attempts had already been made to purify sewage by blowing air through it. The subject was studied by Dr. Angus Smith in 1882, since when many experiments in this direction had been made, none of which had resulted in a practical process. In 1912, however, as the result of observations of the effect of certain green growths on the aeration of polluted waters, experiments were put in hand at the Lawrence Experiment Station in which sewage was aerated in a tank filled with vertical slabs of slate. Following on these experiments, and some which he himself had carried on with an organism known as "M7." Professor G. J. Fowler suggested to Messrs. E. Ardern and W. T. Lockett that new work should be carried on on similar lines.

The method adopted was to draw air continuously through successive samples of sewage in large glass bottles in which the deposited solids were allowed to accumulate. As the quantity of deposited matter increased the time required for the oxidation of the sewage gradually diminished; and the conclusion was reached that the solids (or "activated sludge") obtained by prolonged aeration have the property of enormously increasing the purification of the sewage by aeration, and that the results thus obtained are at least equal to those yielded by efficient bacterial filters. This observation was confirmed in a series of experiments on a larger scale. The sludge must be kept circulating continuously at a velocity variously estimated at from 1 ft. to 2 ft. per second. The volume of air required is from ¾ cubic ft. per gallon upwards, according to the strength of the sewage.

At Sheffield and Bury, owing to trouble experienced from the choking of diffusers, mechanical means have been adopted for keeping the sludge in circulation. At Sheffield an experimental tank is divided by longitudinal walls into channels 4 ft wide and 3,544 ft. in total length, along which the sewage circulates continuously, being propelled by eighteen paddle wheels. At Bury the tank is circular, with a coned bottom and an inner vertical tube, up which the sewage is drawn by a rotating cone and thence flung in a thin flim across the surface of the tank. The power required for mechanical agitation is 15-h.p. to 50-h.p. per million gallons per diem, depending on the strength of the sewage. The results obtained are comparable with those from air-blowing. The process is very sensitive to changes in the nature of the sewage.

The sludge produced is very voluminous. It is rich in nitrogen and phosphates, but contains 97·5-99.5 per cent of water; and so far the problem of drying it remains unsolved.

Action of Sludge

The process is being widely adopted both in Great Britain and in America; but the principles underlying it are as yet imperfectly understood. Much scientific work has already been devoted to their elucidation; and more is urgently required. Several observers have suggested that the agencies concerned in the process are mainly physical, and that the sludge performs a merely mechanical function. The balance of scientific opinion is opposed to this view. Up to a certain point, however, the action of the sludge is undoubtedly physical, for it sweeps the colloidal matter out of the sewage. When the sludge is examined under a microscope it is seen to be wholly bacterial, the species varying with the nature and strength of the sewage and the amount of air blown through it. Larger organisms are also present. The small red worms which are found in large numbers in certain sludges were thought at one time to play an important part in the purification of the sewage, but their presence has been found to be merely incidental.

Well-aerated sludges contain enormous numbers of protozoa, which feed on bacteria; and it has been proposed to kill them off by the selective action of certain dyes. The cell-contents of these organisms may, however, furnish a large proportion of the nitrogen in the sludge.

Much controversy has arisen as to the aerating value of bubbles of air. Mr. J. Haworth contends that bubbles do not readily give up their oxygen to the sewage, and that the aeration which they effect is chiefly due to the disturbance which they set up at the surface.

The accepted views of the rationale of the bio-aeration process are sharply challenged by Dr. A. M. Buswell, who points out that the organisms of which activated sludge are composed are also found in stagnant pools and ditches. He carried out some experiments with a view to ascertaining whether oxygen is as essential to the success of the process as is generally supposed. He reaches the conclusion that stirring is much more important than oxygen, and that activated sludge will grow and develop at oxygen level so low that they can scarcely be measured.

There is a tendency to economize in capital outlay at the cost of increased working expenses; but this is a mistaken policy. The largest item in working expenses is usually the cost of power, which may be economized (a) by limiting the work to be done, and (b) by employing the power to the best advantage. the aeration of sewage brings about a great improvement in a very short time; but the results from a prolongation of the treatment are usually meagre. The amount of purification effected in five hours following the first hour's treatment is often no greater than is accomplished by an ordinary filter in one; while the quantity of sewage which can be dealt with by a filter is more than doubled by an hour's bio-aeration treatment. In many cases it will be most economical to complete the purification by filtration. A further economy of power may be effected by admitting to the aeration tank no more sludge than is absolutely necessary.

There are many ways of using power to agitate sewage. Screw propellers should be efficient, but have not been widely used. Centrifugal pumps afford a useful means of drawing in air and mixing it with the sewage. They have been tried with good results in America. The efficiency of the type of paddle wheel which is generally used is low; but it is doubtless adopted for the sake of the splashing which it effects.

Misleading Conclusions

The conclusions which have been drawn as to the relative efficiency modes of agitation are usually misleading, being based on figures which are not comparable. The diffused air method is heavily handicapped by the loss of power in compression; but it compares more favorably with mechanical agitation than might be expected. The low efficiency of the latter method is due to the power expended in splashing and that lost by friction against fixed surfaces. Splashing appears to be necessary in certain cases; but the need might possibly be reduced by skimming off the oil, &c., which covers the surface of the sewage. The power expended in overcoming surface friction is absolutely wasted, and may be greatly reduced by attention to the design of the tank. It is doubtful whether the best form of tank has yet been evolved.

Local authorities often desire to adapt their existing works to the new process; but the saving thus effected will usually lead to increased working expenses. Where, however, a long outfall sewer is available, there may be advantages in using it as a bio-aeration tank, the velocity of the normal flow in it being usually ample for the purpose.

Fundamental Data

It would appear that the requirements of the bio-aeration process as regards chemical supervision and continuous agitation are less exacting than was originally supposed. In designing works on this principle to deal with a particular sewage, it is necessary to know: (1) the least amount of air which will suffice to purify it; (2) the most effective mode of introducing the air into the sewage; (3) the volume of sludge which will give the best results; (4) the lowest velocity of circulation which will prevent the deposition of the sludge; (5) whether the sewage will be best dealt with fresh, or after a preliminary septic action; and (6) given these fundamental data, the form of tank in which the desired conditions can be provided with the greatest certainty and at the lowest cost.

There is also the important question of the disposal of the sludge.

Before these questions can be answered with certainty, there must be a firm basis of scientific fact on which to build. A number of valuable investigations have already been made; but they have done little more than point the way to lines of further research. In no department of applied science probably is the need for research more pressing. The Royal Commission on Sewage Disposal urged the creation of a central authority competent to undertake such work. The question of costs stands in the way; but the country cannot afford to go on spending £7,000,000 per annum on work of sewerage and sewage disposal without the fullest guidance which science can give.

Is Central Heating a Feasible Plan?

The Dominion Fuel Board is Investigating to What Extent "Community Heating" Can Assist in the Fuel Situation

Considerable advance has been made during recent years in the heating of groups of buildings, community blocks and districts from centrally located boiler plants by means of steam or hot water distributed through a system of underground piping. After passing through the early stages of experiment and development, "district heating" is now being quite widely adopted, especially in the United States where conditions are favourable, and in several cities has acquired the status of an established public service. In Canada there are a number of installations of central heating of groups of buildings for institutions, universities, hospitals, etc., but the supply of heat as a public service has been undertaken to only a very limited extent.

The price of coal is continually rising, the supply of anthracite from the United States, upon which the heating of buildings in so many cities depends, is becoming exhausted, and the idea of district heating is very attractive as providing means for a reduction in the total consumption of fuel, elimination of smoke, reduction of cartage of coal and ashes through streets, in addition to the advantages of cleanliness, convenience, safety and saving in labor, incidental to its use.

Small boilers and furnaces are extremely wasteful in the use of coal, and the replacing of a large number of such small installations by a single large plant of special design results in a very large saving in actual coal consumption and also makes possible the use of inferior fuels which cannot be burned in the smaller furnaces.

Central Heating Being Investigated

The Dominion Fuel Board, which is actively engaged in the study of Canada's fuel supplies and the utilization to the best advantage of the immense coal resources of the Dominion, is considering this phase of the subject not only to determine to what extent central heating in Canada could assist in the fuel situation, but also to make available for the benefit of those interested reliable data and information relating to the establishment of such undertakings. F. A. Combe, a consulting engineer of Montreal, who is conducting a special investigation on central heating for the Dominion Fuel Board, is at present time making an extensive survey of existing heating plants in the United States to study the latest practice and developments and the various aspects in special relation to Canadian conditions which are in many ways peculiar.

There is no doubt that the practice of district heating can be employed to a large extent in many cities, but the conditions do not always exist to make for success of such projects from the financial standpoint. There have been many economic failures in the past of central heating undertaken where the conditions were not suitable or by reason of faulty design or operation. Knowledge of the causes of such failures as well as of successful operations will lead to the development of district heating, and in the not-far-distant future, we may expect to see the supply of heat take its place with electricity, gas and water as a public utility service to the benefit of large sections of our Canadian cities and towns.

The Types of Buildings that Withstood the Japanese Earthquake

Modern Steel and Reinforced Concrete Structures Seemed to Resist the Shocks—Fire Caused More Damage than the Earthquake—Proper Bracing is Good Insurance

The first authoritative information regarding the condition of engineering structures after the earthquake and fire which destroyed portions of Yokohama, Tokyo and other smaller municipalities of Japan on Sept. 1 is contained in a report to the Secretary of State, Washington, D. C., by John W. Doty, president, and W. W. Johnston, engineer, The Foundation Co., New York, who were aboard ship in Yokohama harbor when the quake occurred. From this document, the following information has been taken by Engineering News-Record:

The first earthquake shock occurred at 11:57 a.m. Sept 1, causing the greatest damage in an area of about 80 miles, north and south, and 65 miles, east and west, centering in the neighborhood of Yokohama. The quake at Yokohama seemed to be continuous for a period of from 40 to 60 sec., and was followed by repeated shocks of lesser intensity over a period of five or six days. About 700 shocks were counted during the first four or five days. A report issued by the Japanese Government on Sept. 4 stated that there would be at least an additional 300 shocks before the earth's surface would readjust itself.

Tokyo, the capital and largest city of Japan, has a population, including suburbs, of more than 3,000,000. It is about 18 miles from Yokohama, the seaport, which has a population of 423,000. Japan itself has a population of 56,000,000. The area seriously damaged by the earthquake contains about 4,500,000, or 8½ per cent of the total population.

On Sept. 3 Mr. Doty and Mr. Johnston began an inspection of the effects of the earthquake on various types of structures in Yokohama and Tokyo. From their joint diary of this trip the following excerpts are taken:

Quake's Effects in Yokohama

The sea walls along the waterfront at Yokohama were seriously damaged and portions of them overturned. The first structure of note was the bridge across the canal at the south of the Bund. This was a modern riveted-steel structure about 100 ft. in length. The superstructure was not damaged but the wing walls of one abutment were broken and the approaches to the bridge had settled some 2 or 3 ft.

We walked along the Bund where all the buildings were completely destroyed and there were many fractures noticeable in the streets. The walls of the City Hall were standing but the whole inside of the building had been burned. The street was a mass of fallen electric service wires and at the junctions of the streets it was in places difficult to get through them. A large reinforced-concrete building of some six stories facing the end of that street had been completely burned, but the concrete frame and floors appeared to be undamaged by either the earthquake or the fire. We passed the Chamber of Commerce, a brick building of 3 or 4 stories with a clock tower 100 ft. high. This building was destroyed by fire, but the walls and tower were standing.

The Yokohama Specie Bank, a three-story structure 200 ft. square, equipped with steel fire doors and shutters which had been closed prior to the fire from the outside, appeared to be the only building in this part of the city which was intact. It was subsequently rumored that the building had been destroyed inside by fire which had gained access through the roof. This we were not able to verify.

We passed along the main street where most of the structures were of older type with brick walls and probably wooden floors and partitions. All of these buildings were totally destroyed and most of them appeared to have collapsed prior to the fire, and no wood or other burnable material was to be found amongst the wreckage. This would indicate the tremendous heat of the fire. There were two small buildings of modern reinforced-concrete construction whose general framework seemed to be intact but the contents had been totally destroyed by fire.

The bridge in front of Sakuragicho Station, which is a modern structure, seemed to be in fairly good condition, although the street approaches had settled. In this vicinity there were also large fractures in the ground, some of which were 18 in. wide running at right angles to the canal and parallel to the main shore of the bay a half mile away. This confirms the statement of some eye-witnesses that these fractures were parallel to the crest of the land waves which were plainly visible.

Crossing the bridge we arrived at Sakuragicho railway station. A few of the walls were standing but the structure was, for all practical purposes, totally destroyed and all the district around the station had been not only destroyed by the earthquake but also by the subsequent fires. Not even a wall was standing, but the brick retaining walls of the railroad embankment seemed to be intact.

Two Intact Buildings

Proceeding along the main road to the Yokohama station it was remarkable that the only two buildings remaining intact, a modern type reinforced-concrete and an old fashioned brick building, are side by side and show no indication of having been damaged by either earthquake or fire, although they are surrounded by complete destruction by both. Back of these buildings and against the hill some two blocks distant, the gasometer was uninjured, although the pumping station directly adjoining it was damaged by both the earthquake and fire, and all the other scattered houses along the hillside had been burned. In this section we saw two unburned street cars. Most of the main Yokohama Station had collapsed and had been damaged by fire although some of it was standing.

Under the bridge where the railway crosses the street at the Yokohama station there were many large fissures in the ground and beyond the bridge the street was practically covered with fissures. A 20-ft. embankment on the branch railway had been shaken down and the rails and ties remained suspended. Several structures between the railway and the waterfront remained standing and were apparently uninjured. It cannot be too strongly emphasized that, with the exception of those buildings named and a very few damaged dwellings in the foreign settlement on the Bluff, all of Yokohama has been completely destroyed.

Beyond Yokohama Station along the road parallel to the railway tracks a great many fissures occurred on the streets and practically all the distance to Tokyo. Along this road through Kanagawa and to Kawasaki, a distance of 2½ or 3 miles, all the buildings were destroyed by the earthquake and fire. The railway bridge out of Yokohama, which was constructed of deck plate girders spanning the canal was destroyed by fire. The girders sank vertically about 6 in. by the heat. The ties were completely burned and the rails, although remaining connected, were buckled, resembling a leter "S." This bridge was a two-span 4-track structure about 75 ft. long.

The fire ended very abruptly at a narrow street not more than 20 ft. wide. Along one side of this street the light frame houses had been completely burned, while across the street, although the houses of a similar type had collapsed into a mass of matchwood, they had not caught fire. From this point to the Rokugo River, about half way between Yokohama and Tokyo, there had been no general conflagration and comparatively few of the houses, which were all of native type, had collapsed in the earthquake, although many had been shaken and damaged.

Two railway bridges over the Rokugo River had been damaged but could be readily repaired. The wooden highway bridge on pile bents had been severely damaged by the sinking of two of the pile bents, but remained passable for foot traffic. On each side of and parallel to the river, fissures in the ground were noticeable for 200 ft. from the water's edge.

From the Rokugo River to Shinagawa and beyond, almost to Shiba Park in Tokyo, the damage visible from the road was comparatively small.

At Shiba Park it became evident that although certain districts in Tokyo had not been seriously damaged, in a large part of the city the destruction had been as complete as in Yokohama, and from Shiba Park to the Imperial Hotel many fires were still burning. We arrived at the Imperial Hotel at 7.45 p.m. and found it undamaged but in total darkness. We learned that the American Embassy had been burned and that the Ambassador had established headquarters at the Imperial Hotel.

Damage in Tokyo

In Tokyo an area of approximately 30 sq. mi. was completely destroyed. In this area a small portion known as the Marunouchi district, which included a number of large bank buildings, new office buildings and the Tokyo central station, and a section which included the Peers' Club, the Imperial Hotel and most of the various government buildings were only partially destroyed. That part of the city outside of the completely destroyed districts was severely damaged by the earthquake and isolated fires probably to the extent of 25 per cent. of its value. It is estimated that between 60 and 70 per cent. of the total property value of the city of Tokyo was destroyed.

The buildings which existed in Tokyo can be classified under five heads: (1) Native frame houses constructed principally of pine; (2) small structures with brick walls and wooden interiors; (3) larger government and office buildings of heavy exterior and interior brick walls, with wooden floors; (4) modern buildings of four to eight stories with structural steel frames and fireproof or slow-burning walls and floors; (5) reinforced-concrete buildings of from two to eight stories with concrete floors, exterior walls of concrete, or veneered with masonry or stone. Probably at least 80 per cent. of the buildings in the city were of frame construction, 15 per cent. of brick and frame, and 5 per cent. of the remaining three types referred to above. Buildings are limited by law to a height of 100 feet.

In the area totally destroyed by the earthquake and fire all the buildings, irrespective of classification, were destroyed, the framework only of a few isolated reinforced-concrete buildings remaining standing. In a small unburned area from the government buildings near Hibiya Park to the Marunouchi district, with comparatively wide streets and a number of open spaces, containing principally massive or modern buildings of substantial construction, practically all the structures were more or less damaged by the earthquake, but only a few of them collapsed, although a number of them were burned. This area was saved from the general conflagration principally by a change in the direction of the wind, which caused the fire to turn back just before it reached this district.

Our observation of some of the buildings which remained standing was in general as follows:

Imperial Hotel—The building was standing practically uninjured. Following the moat toward the Marunouchi district from the Imperial Hotel, the Life Insurance Co.'s office building, a modern structure, was not damaged by the earthquake and fire, although directly behind it a large three-story frame structure had burned.

Police Headquarters—This heavy governmental type of structure had withstood the earthquake but had been gutted by fire some time later.

Imperial Theater—The roof of this building, a modern structure of its type, collapsed on the first shock, and fire, which started from within, burned the whole interior but most of the exterior walls are standing. This example shows the necessity, in earthquake zones, of strongly buttressing the side walls and practically bridging the roofs in theatres or similar structures with large roof spans. If a large number of people had been in the theater at the time of the earthquake probably none would have escaped.

The Kaikwan—This structure, known as the Palace Restaurant, next beyond the Imperial Theater, was a modern steel-frame structure of six stories. The shock of the earthquake caused the outside walls and the interior partitions of the third story only to shatter and fall, leaving every steel column on that floor exposed. The lower two stories and the upper three stories appeared to be only slightly damaged. The exposed steel columns of the third floor were bent out of plumb, however, and the upper three stories were thrown on an offset of approximately 15 in. from the line of the lower two stories. The building had not been damaged by fire.

There were a number of structures beyond the Kaikwan which were only slightly damaged by the earthquake and fire. These were principally three or four stories in height, of ordinary brick construction. Nearby, the structural steel framework for a new building which was being erected had collapsed and carried down with it some 200 workmen. In erecting steelwork where earthquakes are liable to occur each floor should be riveted and sufficient sway-bracing should be embodied in the design to make the frame of the building independently strong.

N. Y. K. Building—A new, modern, 6-story structure, which had just been opened, was of structural steel with very heavy masonry and brick walls. The exterior walls enclosing the second story were fractured by the earthquake, and cracks in the wall formed a distinct X in each panel running diagonally from top to bottom. The first story and the stories above the second appeared uninjured.

Marunouchi Building—A modern steel-frame building of six or seven stories occupied an entire block. Although the building stood, some of the outside veneer was fractured or had fallen off. Across a wide plaza from the Marunouchi Building the Tokyo Central Station and Hotel, a massive brick-and-steel structure of four stories, was not seriously damaged by either the fire or the earthquake. The Kaijo Building was a modern six or seven story office building, having structural steel frame and brick exterior walls. The walls of this building were shattered throughout and in places had fallen to the ground, exposing the steel work. This building did not take fire. The Industrial Bank Building, probably the most modern building of its type in Tokyo, which had just been completed, the frame being either of reinforced-concrete or steel (our impression is reinforced concrete) seemed to withstand the earthquake without any damage whatsoever, even the large windows being unbroken.

Bank of Japan—This structure, outside the Marunouchi district and across the canal, is of old type, with heavy masonry walls. The fire doors and shutters were closed and most of this building seemed to be undamaged by either the earthquake or fire. It is the only building of importance in the totally burned zone that is now standing in usable condition. All other structures in its vicinity, including the Mitsui Building and the Mitsukoshi Department Store, were burned, but the frames of a number of modern structures of reinforced concrete type remained standing, although the buildings had been gutted by fire and, in many cases, the exterior walls thrown down. In the greater portion of the 30 sq. mi. of the totally destroyed area, however, few frames or walls of any description remain standing.

Most of the small canal bridges of modern construction seem to be little damaged.

In reconstructing Tokyo a proper building code should be adopted to minimize, as far as possible, damage by earthquake and, what is much more serious, the spread of fire, as the destruction by fire was far greater than by the earthquake.

Good Report from the Slate Industry

The slate industry is having a good year. Present indications show good business on books but no boom or over production. Sales in dollars and cents for first nine months of 1923 are ahead of 1922 by 15 to 20% according to firms reporting to National (U.S.) Slate Association.

Now is the opportune time for architects, builders and owners needing slate to purchase requirements and avoid the congestion of next spring. It is welcome news to builders and owners who must get buildings and homes under roof now that industry can handle immediately 30% more roofing slate business than present unfilled orders. About 25% more electrical and structural slate could be delivered this year if ordered immediately, particularly small switch bases. Where blackboard slate is required before the first of year to complete schools for the opening of the second term, special notice should be given to quarries and orders placed at once to enable the industry to make deliveries on time. In spite of the great school building program of the country and the demand for blackboards, where requirements are anticipated the industry is making prompt deliveries.

The National Slate Association, as part of its program to assure the public satisfaction in uses of slate, is conducting an exhaustive investigation and research to determine the proper kind of nails to use for applying slate roofs. Architects, engineers, roofers and manufacturers of nails of all kinds are cooperating in this important work. Results of this survey will be made known at slate industry meetings in New York in January.

A program of constructive action surrounded with pleasurable features is being laid out for this third annual conference of the slate industry. Quarry and slate mill owners, managers, superintendents, executives, as well as members of the trade, dealers, jobbers, roofing and other slate contractors will gather at New York, Hotel Commodore, on January 21, 22 and 23, to discuss common problems and bring forth all the progress of the past year for better productions, distribution and utilization of slate and slate products.

New Sizes for Rawlplugs

Inventions Limited, agents for the Rawlplug Company of Canada, Montreal, have announced several new sizes of Rawlplugs for use with lag screws. They are made in lengths from 1½ in. to 4 in. and in the following diameters; 3/8 in., 7/16 in., 1/2 in., 5/8 in. and 3/4 in.

Reinforced Concrete in Municipal Engineering Works

English Practices and Viewpoints Outlined in Paper Read Before Royal Sanitary Institute by G. W. Palethorpe

In presenting this paper on reinforced concrete to you, I shall not deal with the question of design, as there are several very excellent text-books dealing with the subject from all points of view, and though not difficult, it would require much greater space than could be covered by a short paper. I shall endeavor—(1) To enumerate some of the many advantages of reinforced concrete; (2) to give a short list of municipal works upon which it has been used, and (3) to give a few notes on the actual handling of the material in the construction of the works.

From quite an early date reinforced concrete has been much used in municipal work, and there is probably no branch of engineering that has employed it to better advantage. There are very few works in which the construction does not commend itself very favorably, and the advantage of reinforced concrete will be admitted by all in the construction of foundations, bridges, reservoirs, retaining walls, and various other works which will readily recur to the mind.

Advantages

Some of the advantages of the use of reinforced concrete are as follows:—

(1) The majority of the work is carried out by unskilled or semi-skilled labor, the only tradesmen required are the joiners for the shielding, and blacksmiths for bending the steel, but with the aid of bending machines the rods can be bent cold and the smith's work brought to a minimum.

(2) Reinforced concrete increases very much in strength with age, and may be considered practically indestructible. No painting or maintenance is required as in the case of steel and wood, and it is quite easy to repair any part of a structure which may accidentally become damaged.

(3) A building of reinforced concrete is practically fireproof. In most cases a cover of 1 in. of concrete is sufficient to protect the steel from fire, though an aggregate that will splinter with heat, such as limestone, should be avoided. Experiment and actual experience show that the smaller the aggregate the less the injury.

(4) Structures in reinforced concrete being monolithic, offer great resistance to vibration; this makes them invaluable in the case of engine houses, mills and factories.

(5) A great advantage in favor of reinforced concrete from the point of view of the designer is that, owing to the monolithic construction, most of the beams and slabs may be considered as being either fixed or partially fixed, with a considerable reduction of the bending moments.

(6) In construction concrete allows more adaptability than any other material. It not infrequently happens that, owing to a soft place in the ground, foundations have to be altered, or owing to unforeseen circumstances the spacing of columns, &c., has to be amended. Everyone with experience of steel construction knows the delay caused by any alteration, whereas reinforced concrete is comparatively easy to alter, but in all cases the designer must be consulted before any deviation from the plans is made.

(7) In most cases reinforced concrete will compare favorably in cost with average brick or steel construction, and where local conditions are advantageous the saving in first cost may be as much as 30 per cent.

(8) The material has great possibilities for architectural treatment though successful instances are still rare.

Disadvantages

There are a few disadvantages in the use of reinforced concrete, but I venture to say that for certain structures, if both sides are carefully weighed up, the advantages completely outweigh the disadvantages. The disadvantages are as follows:—

(1) The weight of a reinforced concrete structure is more than a steel-framed one, and so requires more expensive foundations; on the other hand, it is considerably lighter than brick construction.

(2) The time required for construction is longer than for steel, as in the case of steel, while the foundations, &c., are being put in, it is being built up in the workshops and is ready for erection when required.

(3) Owing to the time concrete requires to set, it is impossible to have a structure ready for use under a considerable period, varying with the weather and the purpose for which the structure is to be used.

To instance the various uses that reinforced concrete can be put to, I will give a few details of works that have been constructed by the Hull Corporation.

There are four inverted syphons carrying sewage under large agricultural drains, at present in course of construction; these are of 36 in. diameter reinforced concrete tubes of Stanton-Hume manufacture, each 4 ft. long, surrounded by concrete. Previous syphons have been of cast iron. The price of the concrete tubes is 50s. 3d. per yd., and the approximate price of cast-iron pipes is 99s. per yd. It is anticipated that there will be a reasonable saving in cost of laying owing to the more easy handling of the short pipes.

The corporation has constructed several concrete sewers, 5 ft. by 3 ft. 4 in. elliptical, and 4 ft. by 2 ft. 8 in. and 3. ft. 6 in. by 2 ft. 4 in. egg-shaped, the sides being from 7 in. to 9 in. thick according to their position. Several of these sewers have been made recently as unemployment relief works. The price of a 3 ft. 6 in. by 2 ft. 4 in. sewer 10 ft. deep carried out by this labor cost £4 10s. per yard complete. Briefly, the construction is as follows:—When the excavation is completed, 6 in. of concrete is put in the bottom, on this precast concrete invert blocks are laid to correct falls. The wood shielding is made in two portions, each 6 ft. long, the lower part being collapsible to facilitate removal, six bottoms and 12 tops are used on each job. The bottom shielding is placed on the blocks and strutted off the sides of the trench, and concrete placed around and well rammed. The top centres are supported from the invert blocks and the concreting completed. The bottoms can be stripped after twenty-four hours, whereas the tops require at least two days. The concrete is usually 8 to 1, and the aggregate used is Trent gravel, a mixture of sand and shingle, care being taken to add sand or shingle as the case may be when there is an excess of either material.

After the war, owing to the high prices and the great difficulty of obtaining fireclay street gullies, the corporation commenced making them of reinforced concrete. They are 14 in. by 14 in. by 2 ft. 7½ in. inside measurements, and the costs work out today at 25s. each, whereas a quotation in April for fireclay gullies was 56s. each. The output is two to three per day, which of course, could be increased if desired by making more form boxes.

The corporation also makes fence posts, gate posts, landings for manholes, and landings for vaults in reinforced concrete, and kerbing and channelling in ordinary concrete.

Notes for the Inexperienced

For the final portion of this paper I should like to give a few notes upon the construction of reinforced concrete that may probably be of assistance to those who have not a great amount of experience in these works.

The first consideration is to have a good, live foreman or clerk of the works, who will conscientiously perform his duties and see that all the details of the work are carried out.

All steel should have an ultimate tensile strength of 28 to 33 tons per sq. in. Steel should not be oiled, tarred, or painted, but all loose scale or rust must be removed before the reinforcement is placed in position.

The most important and, generally speaking, the most difficult work in connection with the erection of reinforced concrete structures is the accurate placing of the steel, which must be fixed in exactly the position shown on the plans; carelessness in regard to this important feature has led to several failures in reinforced concrete structures. Foremen or clerks of works must check all rods before any concrete is placed.

A difficulty generally met with is to support beam rods in such a manner that the cover at the bottom will be as shown on the plans. This is often done by packing up the steel from the shielding by means of blocks of wood of the requisite thickness and drawing these as the concrete is placed. After the shielding has been stripped it is frequently found that packings have been left in by accident, which have to be cut out and the concrete patched up again. A very neat method of supporting rods from the bottom of the shielding is to use small pre-cast cubes of concrete, which can remain in the work without any disadvantage.

If pre-cast beams are to be used, the top side must be distinctly marked to avoid the risk of pttting in beams upside down. Shielding must be substantially and accurately constructed, well fixed and supported to take the weights they are required to carry. Long beams should be framed with a camber of about 1-350 span. Column boxes should be built up on three sides, and the fourth side should be gradually built up as the concrete is placed.

All shielding for beams should be held in position by means of wedges, so that any movement can be taken up, and on completion the shielding can be removed without risk of jarring the concrete. The sides of beam boxes should be secured to the bottom in such a manner that they can be stripped without disturbing the bottom timber, and so allow the air to get to the concrete to assist the hardening before the beam is finally stripped.

Do not use one more nail for fixing the shielding than is necessary; remember that the shielding is the most expensive part of the work and must be used over and over again.

Immediately before placing the concrete the shielding should be carefully cleaned out, trued up and coated with soft soap, form oil, whitewash, or some other suitable preparation to facilitate the removal of the shielding.

The aggregate may be of almost any hard, clean material, such as granite, shingle, stone, gravel, or broken brick, but for reinforced concrete work granite or shingle is the best. Concrete should always be proportioned so that the sand and cement are respectively in excess of the voids in the aggregate and sand. The percentage of voids in the aggregate is usually about 40 to 50 in sand about 35; 4-2-1 concrete will generally give the best mixture.

The aggregate should vary in size from ¼ to ¾ in., and the sand up to ¼ in., and 75 per cent of the sand should pass through ⅛-in. square mesh.

Mixing the Concrete

The amount of water to be used in the mixing is a matter of great importance—the mixture should neither be too dry nor too wet, but should quake slightly when rammed. It is better to err on the side of a slight excess of water than to use a concrete which is too dry. The wet mixture will only yield about two-thirds of the combined volumes of the dry materials, as the sand and cement go to fill up the voids in the aggregate.

See that the concrete is well mixed and, if possible, use a mixing machine. Lay quickly in small quantities, and see that it is well rammed round all the rods and is thoroughly consolidated.

Each section of concreting should, as far as possible, be done in one operation. When work is resumed upon any concrete that has set the face should be roughened, washed clean and covered with a layer of cement mortar. The new concrete should then be rammed against the old as hard as possible without injuring it.

Care must be taken to avoid disturbing the set of concrete until sufficient time has elapsed for the setting to take place; no load, such as walking over it or laying planks upon it should be allowed.

See that the reinforcement rods are not moved in ramming, and that steel is not fixed in the vicinity of new concrete where vibration of the steel might destroy the set of the concrete. Keep concrete moist and covered in hot weather, and protect against frost.

No hard-and-fast rule can be made for the time to be allowed before stripping the shielding, all depending upon the weather and the size of the work, but the period should be approximately from fourteen to twenty-eight days. The time must be left to the judgment of the person in charge of the works.

In many reinforced concrete works it is necessary that the walls should be waterproof. There are a few patent waterproofing compounds at present on the market that admirably serve their purpose, but it has been shown by experiments that many will cause a loss of strength. Some authorities say that the use of 5 per cent of hydrated lime added to the weight of cement will render the concrete quite as impervious as most of the trade compounds. There is no doubt that carefully graded concrete with sufficient cement to fill the voids with an excess of 5 per cent will give a perfectly impervious concrete under moderate heads.

Toronto E.I.C. Meeting

This week's meeting of the Toronto Branch of the Engineering Institute of Canada, on Thursday, Nov. 15 will take the form of a smoker in the east common room of Hart House, University of Toronto. Mr. Fraser S. Keith, secretary of the Institute, will give a brief address, the rest of the evening being devoted to stunts and good fellowship.

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Purchase Equipment in the Slack Months

Contractors who, of necessity, have to slacken their field operations during the winter months, generally get into the habit of "shutting up shop" and taking things easy. If they could jaunt off in a vacation mood to Florida or California, there might be plenty of justification for a few months respite from the cares of contracting, but the profits are scanty enough as it is without having them annihilated through taking a few weeks holidays. The result is that contractors just hibernate, displaying little concern in matters pertaining to their business until signs of spring awaken their dormant interests. Surely an unprofitable procedure!

Happily, there is a growing appreciation on the part of both contractors and the public of the desirability of lengthening the construction season. This means that there will be more winter work for those contractors who can handle jobs of this character. However, even for those who perform a class of construction that is incapable of being handled in cold weather, there is much that can be done in the off-season. Only one matter will be referred to in this comment and that is the purchase of equipment and supplies.

During the slack season it should be possible to do a little stock-taking for the purpose of scrapping worn and obsolete machinery and determining upon additional equipment. Spring business then will not catch the contractor unprepared. As it is, much valuable time in the most important part of the year is wasted because equipment needs are not anticipated. With few exceptions, new machines could be bought during the winter just as well as in the spring and summer, with the result that the contractor would have greater peace of mind at the time when the rush work demands his attention. During the winter, the contractor would have greater opportunity to study the market and pick out the type of equipment that would best suit his needs. Furthermore, he would secure better delivery and, possibly, a better price. At any rate, there are enough advantages to winter buying to make it worth a contractor's while to investigate its possibilities.

A National Fuel Policy

Events during the winter of 1922-23 showed that Canada—especially that part of it that depends on imported coal—had a vital fuel problem. As a matter of fact, the problem had always been with us but it had never been brought to the serious attention of the people until strikes in the United States coal fields made a large part of Canada shiver all last winter. While this year conditions in the mining districts are happily more satisfactory, there is plenty of evidence that the people of central Canada are having a troublesome time to secure fuel in ample supply—indication enough that Canada's fuel problem is not of just passing importance.

The climate of Canada must be acknowledged for what it is. It is no use hiding from the fact that we have cold and long winters. The problem is: how can those cold and long winters be placed under control so as to be comfortable for the maintenance of life and the continuance of industry? This emphasizes the need for a policy for providing fuel to make the controllable climate possible.

The importance of a national policy as regards fuel is stressed in a recently issued brochure by G. R. Pratt, an engineer who has been active in laying before the people of central Canada the value of Western fuels. Mr. Pratt states that Canada is the one country which cannot develop without some fixed policy as to fuel. "We could makeshift to exist with small amounts of food. We could tide over a year without purchase of new clothes, but we could not remain alive without sufficient fuel to keep us from freezing. Doing as Canada is today, trusting to luck for its fuel, do you think that it could build up a population, with the periodical shortages which would be bound to occur?"

This leads Mr. Pratt to emphasize that Canada's present coal consumption is around thirty-two million tons. About 54 per cent of this is brought in from the United States at a cost to Canada of about one hundred million dollars. The consumption of coal per capita has doubled during the last 20 years. Decrease in available wood and increase in industrial development will probably result in the same increasing ratio of consumption per capita for some years to come. Consider Canada with twice the population 20 years hence. This would necessitate one hundred and twenty-eight millions of tons of coal per year. If following the same lines as at present we should spend four hundred million dollars in the United States for coal.

Mr. Pratt endeavors to show that Canada's dependence on the United States for fuel is weakening her national development and that before she can have a mind of her own she must first decide upon a fuel policy. "The condition today is," concludes Mr. Pratt, "that Canada requires certain coal for the upkeep of the country. Canada has coal sufficient for hundreds of years for any population which she might have, within reason or without reason. Unfortunately the coal is at the extreme ends of the country, east and west. The centre portion has become heavily populated and has no coal. One reason for this heavy population is due to industrial work which has grown up on account of its source of coal supply, which has been and is now obtained from the adjacent coal fields of the United States. Is Canadian coal to be taken to this industrial centre or shall the industries move to the coal? What is required is a national policy on fuel that will be a profit to Canada."

Sir Adam Beck Protests Chicago Diversion

Issues Bulletin Refuting Statements of Officials of the Sanitary District—Nothing Can Compensate for 10,000 c.f.s. Diverted

Sir Adam Beck, chairman of the Hydro-electric Power Commission of Ontario, in a recently issued bulletin, "exposes and refutes statements by officials of the Sanitary District of Chicago respecting the diversion of water from the Great Lakes." The reason Sir Adam feels called upon to question these statements is indicated in the bulletin in these words:

"It was immediately following the Toronto meeting of the 20th of September [between officials of the Sanitary District of Chicago and Sir Adam Beck—Ed.], that President Healy of the Sanitary District issued a formal statement to the public press which is of such an extraordinary nature and which creates an impression at such variance with the facts that it is necessary in the public interest for me to refute the misleading statements which have been thus published. The need for such action is emphasized by the fact that various statements contained in President Healy's formal statement continue to be reproduced in the public press, not only of the Dominion of Canada, but also of the United States."

Sir Adam first corrects statements of Mr. Healy that convey the impression that he was willing to have the diversion difficulties investigated and solved by a group of engineers. Mr. Healy's statement in this connection is reported as follows: "The result of our Conference with Sir Adam Beck and his Commission was an expression of willingness on his part that the great questions involved in the composing and harmonizing of the various interests should not be decided by the mere fiat of the Chairman of the Commission, but by conference, study and investigation of eminent enginers, representing the Hydro-Electric Power Commission of Ontario, and those of the Sanitary District of Chicago."

To this Sir Adam Beck replies: "This statement is incorrect and very misleading. At the close of the meeting, it was asked by Sanitary District officials if the Hydro-electric Power Commission would be willing, later on to have its engineers look over certain plans of proposed remedial works for the regulation of lake levels prepared by the Sanitary District engineers and receive from the Sanitary engineers such information and explanation as might be necessary for a proper understanding of the plans. I stated that our engineers would be ready to look over the plans, but nothing further was suggested and certainly nothing further was intimated or intended by me in this connection. It is entirely misleading to suggest, as Mr. Healy does, that the subject of diversion at issue is to be submitted to study and investigation by a group of engineers, including representatives of the Hydro-Electric Power Commission. . . .

"The necessity for a specific refutation of the statement of Mr. Healy respecting an engineering conference is evident from the fact that in one form or another it has been repeated many times in the public press. Thus, the Chicago Journal, as recently as September 28, 1923, under the caption 'Engineers May Fix Chicago's Lake Rights,' states:

> Sir Adam Beck, chairman of the Ontario commission, accepted a proposal of George M. Wisner, consulting engineer of the sanitary district, 'that the questions relating to the effect of remedial works proposed by the sanitary district upon the hydro-electric power production at the Niagara Falls and in the St. Lawrence river should be left to engineering experts representing the two bodies to investigate thoroughly and then report.'

"This statement thus published is incorrect and has been made by some one who either does not understand the facts or whose intention it is to mislead. I did not authorize, nor in any way concur in any arrangement by which our engineering experts were either to "investigate thoroughly" or to "report" upon any proposal for remedial works or upon any other suggestions made by the Sanitary District of Chicago. It was upon the earnest solicitation of the Sanitary District officials and, one may add, on the basis of common courtesy, that I, as previously explained, stated my willingness to afford the officers of the Sanitary District of Chicago an opportunity to explain the engineering features of their plans.

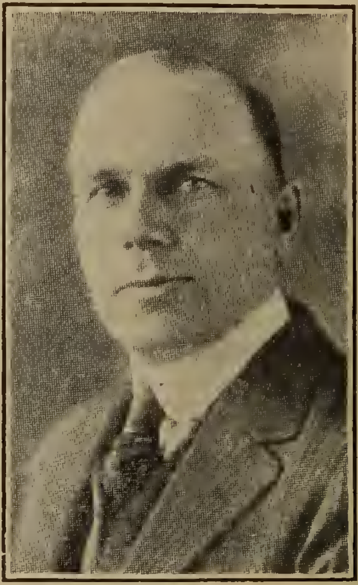
"Great national and international interests, such as navigation with all the complicated questions respecting water levels in the harbors and water powers, as well as the rights of riparian owners too numerous to specify, are involved in such proposals as have been made by the Sanitary District officials, and it is obviously absurd to suggest that the engineers of one or two of the interests could, as the Chicago Journal states, 'fix Chicago's lake rights.' "

Objections From Many Directions

Sir Adam points out that the Hydro-electric Power Commission is not, as has been represented, the only,

Canada's Contractors—R. L. D. Taylor

Mr. R. L. D. Taylor, vice-president of the Macdonald Engineering Company of Canada, Limited, construction engineers, C. P. R. Building, Toronto, is well known in Canada and the United States, having been associated for many years with the grain movement at Port Arthur and Fort William and in the Canadian North-West. He is the late president of the Mathews Steamship Company, and Great Lakes Steamship Company, and at one time was closely identified with the Mutual Steamship Company, since absorbed by the Canada Steamship Lines. He was instrumental in disposing of the first Canadian steamship bonds and arranged for the building of three large freighters on the Clyde in Scotland, two of which were destroyed by submarines during the late war. At present Mr. Taylor is devoting all his time to the interests of the Macdonald Company, who are large general contractors for heavy construction, such as grain elevators, flour mills, cold storage plants, cement plants, coal storage docks, bridges and other substantial work. Among some of the buildings erected by this company may be mentioned, elevator "B" Fort William, for the Canadian Pacific Railway; Ogilvie's flour mill and elevator at Fort William; Lake of the Woods mill and elevator at Keewatin; the Canadian Swift Company's plant at Montreal; Dearborn Chemical Building at Toronto, etc. The Macdonald people are interested in all heavy construction contemplated throughout the Dominion and being a strong Canadian Company, it is reasonable to suppose that they will secure a share of the work offering.



Mr. R. L. D. Taylor

nor the chief, objector to the Chicago diversion.

"Time and again," he states, "the government of Canada has made representations to the Federal authorities at Washington, protesting against the Chicago diversion. Various interests representing the commercial activities of the Dominion have been behind the Dominion government in its protest. Such organizations as the Dominion Marine Association, The Shipping Federation of Canada, comprising the great Atlantic shipping lines, the Harbor Commission of Montreal, the Harbor Commission of Toronto, the Richelieu and Ontario Navigation Company, Canadian water power interests, boards of trade throughout the Dominion including the Montreal Board of Trade, and many other organizations have, during past years, publicly filed memorials against the action of the Sanitary District of Chicago in diverting the Great Lakes waters from their natural channel to the Mississippi river. In the United States protests have been filed by corresponding organizations. It is common knowledge that state authorities in the United states, notably, those of Wisconsin, have instructed actions in the courts against the Sanitary District of Chicago respecting its diversion."

Jurisdiction Lies With Government Authorities

"In conclusion," Sir Adam states, "I wish to emphasize that, in my introductory remarks to the officials of the Sanitary District of Chicago at the meeting herein referred to, I particularly pointed out that the issues which they sought to deal with were not those falling under the jurisdiction of the Sanitary District of Chicago and the Hydro-electric Power Commission—an organization constituted by special Act of the Legislature of the Province of Ontario. I emphasized the many other interests involved, such as the Province of Ontario itself, the Province of Quebec, the State of New York and other States of the Union, as well as the governments of the two great countries whose interest are covered by the Boundary Waters Treaty.

"The so-called remedial proposals of the Sanitary District of Chicago are entirely inadequate to remedy the situation which they have created. This is true, if for no other reason than the fact that remedial works can never compensate the lowered levels of the St. Lawrence river below the proposed works, nor can they compensate for serious damage occasioned to the port of Montreal. With respect to the effect of proposed remedial works upon water powers of the Niagara and St. Lawrence rivers, I repeat what I said in my published statement of August the 11th.

'The feature which cannot be too strongly emphasized is that it is impossible for the Chicago Sanitary District or any other agency to do anything by means of the regulation of levels of the Great Lakes to compensate the Dominion of Canada for its loss in the international waters which Chicago is diverting.

No matter what is done in the way of compensating for levels, after the compensation is accomplished 10,000 cubic feet of water per second diverted from the Great Lakes could be restored to the Great Lakes and rivers and contribute, as an addition, all the benefits derivable from such quantity of water.'

The Orton & Steinbrenner Co., 608 S. Dearborn St., Chicago, Ill., manufacturers of locomotive cranes, buckets and coal crushers, have just completed a large addition to their works at Huntington, Ind.

For the Building Supply Dealer

Forty Years in the Plaster Business

The Windsor Plaster Co., of Windsor, N. S., Has Thrived Under the Direction of C. H. Dimock and J. P. Smith

The Windsor Plaster Co. Ltd., of Windsor, N. S., is considered to be one of the most important industries of that part of the country and to the town itself the company is an important industrial asset. Both Mr. Henry Dimock, president, and Mr. Jesse P. Smith, secretary, have been forceful factors in Windsors' development and to them is due in no small measure much of the civic improvement that has taken place in recent times.

The Windsor Plaster Mill has a unique history, having been started over 40 years ago by the late James Bennett who saw its possibilities when calcined plaster was almost unknown in that locality. About thirty years ago Messrs. C. H. Dimock and Jesse P. Smith purchased the mill and started to build up the business on a larger scale.

In the great conflagration of 1897 which swept seven-eights of Windsor out of existence, the plaster mill went with everything else. The following spring the company erected on the old site the mill which stands today. When the mill began operations under its present ownership the crude gypsum was purchased from quarry owners but the necessity for a quarry presented itself and after a few years the Wilkins quarry was purchased. This property covers over a hundred acres and has a number of acres suitable for farming.

Also Have a Stave Mill

In connection with the ground plaster business the Company erected about eight years ago a large stave mill where all the barrels used by the company are made. During the years of the war when troops were quartered at Windsor, this building was given free for winter quarters of soldiers in training. The stave mill provides a splendid market for farmers with small woodlots, who are kept busy hauling the small logs suitable for barrel staves.

The products of the Windsor Plaster Co., include calcined plaster, land plaster, selenite, hardwall plaster, etc. The market for this class of products covers the Maritime provinces, Quebec and Ontario.

The president of the company, C. H. Dimock, has had a most successful and useful business career. When a young man he was called on by the death of his father, the late Shubel Dimock, a well-known shipbuilder in the days of wooden ships, to manage his father's fleet of sailing vessels. This charge included ships, barques and schooners, eight vessels in all. One of the fleet was the "Uruguay" the first four-masted schooner built in Canada.

Mr. C. H. Dimock (standing) and Mr. J. P. Smith (seated), president and secretary, respectively, of the Windsor Plaster Co., Windsor, N.S.

When iron and steel and steam power replaced wooden ships, Mr. Dimock with that shrewdness for which he is noted, saw the decline of shipping and judiciously began to dispose of his vessels, coming out of the transactions creditably.

Jesse P. Smith, Mr. Dimock's partner, who is seen in the picture seated at his desk, was this year elected to the office of mayor of Windsor by acclamation. He

A panoramic of the yard and plant of the Windsor Plaster Co., Windsor, N.S.

is also a native of Windsor, and has the best interests of the town at heart. He undertook the duties of mayor at the urgent request of the prominent business men who believe that the civic welfare can best be safeguarded by a man who has proved his ability as an excellent business man and citizen, loyal to home interests. Mr. Smith had a number of problems to tackle on taking office, and is taking hold of them courageously and in a fine spirit of optimism which sees, in the future, prosperity for the town and the community around.

Co-Operative Spirit

As an indication of the spirit that permeates the heads and staff of the Windsor Plaster Co., it is only necessary to refer to the picnic which was held last Labor Day, at which the employees and their families were guests of Mr. Dimock and Mr. Smith.

This custom of giving a picnic to the employees of the plaster mill has now become a yearly affair which is looked forward to by all concerned as a happy event in the year's labors, where the fraternal spirit between the men and their employers is fostered and becomes an incentive to all to do their best for the other.

Three Letters that Sold Steel Basement Sash

When a certain firm of Denver, Colorado, took on a line of steel basement sash last year, they took immediate steps to see that architects, contractors and building owners became familiar with the many advantages of the goods. They backed up the manufacturer's advertising with newspaper advertising of their own and sent a series of three letters to architects and builders in their city.

The first letter brought an order from a contractor that paid for the entire mail effort. It is, of course, impossible to trace many direct returns to a campaign of this kind. They feel that the letters covered this particular subject pretty thoroughly. They were sent out in August.

One of the unexpected benefits of these letters was the effect on their salesmen. While the letters contain no information not set forth in the printed matter, they brought out certain points about steel sash that had evidently not impressed the salesmen before—they were given selling arguments that they used in their work to good advantage. The letters follow:

(FIRST)

Dear Sir:

More and more people are saying, "I want the basement of my next home to be light and airy." It is up to the builder to give them what they want.

It was a problem 'till along came Steel Basement Sash. This is the economical and sensible means of filling this need. The following is a summary of the qualities of this unusual building necessity:

Easily installed in any construction.
Easily glazed and screened.
Large glass area for size of opening.
Hardware attached.
Cannot warp or stick.
Sash is removable.
Channel construction means maximum strength.
Inexpensive.
Painted when they leave factory.
The owner wants modern equipment. Why not try them on your next job? The price compares favorably with other kinds of cellar sash.

(SECOND)

Dear Sir:

Steel Basement Sash offer the builder the most attractive and economical way to give his clients more sunlight in the basement.

The owner uses his basement more than formerly and wants it well lighted. The wise contractor will give it to him. You can put in the same number of sash, the same wall opening you have always used, but have the basement 40% to 66 2/3% lighter.

How?

Our Steel Sash have small rolled steel frames and vertical bars. By adding 3 inches to the glass size you get the masonry opening, while other kinds of windows require approximately 9 inches. The strength of these sash is accentuated by the channel construction of the rolled steel parts. This also keeps them from warping and sticking.

The inclosed folder shows the methods of installation and some of the numerous other advantages you will find in Steel Basement Windows. We have in stock the three-light windows illustrated. Telephone Main 318 for prices.

(THIRD)

Dear Sir:

Do you know that it is not necessary to brace a Steel Basement Sash while you lay up the wall? Slap the mortar on the sill, press the sash down into it, and the channel fills with mortar, holding it in place.

These sash also eliminate fitting. The ventilator (sash) is in place when you set the frame. When you want to glaze it, take out the two hinge pins and the ventilator comes out. To replace it, insert the pins.

Another advantage! All the hardware is attached. You don't need to go around afterward and see that a hinge or lock was not forgotten. A wedge lock (which is fastened to the chain that holds the ventilator open) does away with the bothersome spring catches.

When it comes to painting, this "economy hound" requires only one-sixth the time and material usually put on a basement sash. Being made of solid steel bars, and painted one coat before leaving the factory, there is no danger of rusting out.

We carry in stock three-light sash, glass size 10 in. x 12 in., masonry opening—2 ft. 9⅝ in. x 1 ft. 3¼ in., and with 12 in. x 18 in. glass. 3 ft. 3⅝ in. x 1 9¼ in. masonry opening. Consider the advantage of installing this economical sash in your building. At present, the smaller is $5.15 and the larger $5.75 glazed.

Booklet on Vacuum Pumps

The Canadian Ingersoll-Rand Company, Limited. Sherbrooke, P. Q., announce their bulletin K-315, describing a new line of belt and steam driven dry vacuum pumps which are produced at their Sherbrooke plant. This catalogue contains 20 pages and numerous illustrations covering these machines, and should be of value to any one interested in either belt or steam-driven vacuum pumps for use in canning factories, chemical plants, smelters, salt mines, condensed milk factories, pulp and paper mills, etc.

Hints for the Contractor

Economizing Materials Storage Space in Building Construction

Storage and handling of materials in building construction is always a problem in metropolitan districts, where traffic is so great streets are not usable for storage. Methods used in the construction of the Atlantic Bldg., a 24-storey structure recently completed at the corner of Broad and Spruce Sts., Philadelphia, are believed to represent about the best practice in material handling. They are described by H. S. Hines, in Engineering News-Record.

The building occupies the lot from Spruce to Manning St. and Broad St. to a restricted areaway at the rear of the building line and the absence of any material stored on the streets has been very noticeable. The sidewalk along Spruce St. was removed and at the completion of excavation was planked over. Trap doors were cut in the planking, allowing the trucks to back up to the curb and dump all foundation concrete material directly into bins at basement floor level. from there it was handled into portable mixers set at convenient places in the sub-basement.

The steel frame was erected by using two 80-ft boom derricks, placed in such positions so as to reach three sides of the building. All material was "picked off" the wagons and trucks and landed on floors. Delivery was timed according to the speed of erection. After the first floor steel was set and riveted this floor was planked over solid and a driveway provided through the rear of the building from Spruce to Manning St. and down the centre corridor from the Broad St. entrance. Under this driveway was placed the cinder and sand bins, mixer, etc., for the fireproofing.

A ¾-yd. bucket was placed in one of the elevator hatches and the cat head raised as each floor was poured. The elevator contractor followed the steel erection very closely with his main rails and the general contractor utilized these for his three material hoists, doing away with any street obstructions whatsoever.

The delivery of outside terra cotta, brick backing, window frames, etc., was made directly onto these hoists and distributed on their respective floors. A portable mixer was placed in the sub-basement near one hoist and all mortar was lifted in wheelbarrows and distributed directly where wanted.

There is a 3½-in. monolithic concrete top floor over the entire building. For this work the aggregates were stored at a convenient place on the first floor, a portable mixer was placed near one of the hoists in such way that it would dump directly into concrete buggy which remained on the hoist, then hoisted and delivered to the floor where wanted. These hoists were used by the night crew to lift the tile, conduit and all other material for the next day's run.

The elevator contractor used a gasoline hoist in one hatch for his equipment. The plumbing and heating contractor rigged an electric hoist in one of the air shafts which took care of all their material. There were three Skinner engines weighing 10 tons each unloaded on the first floor and lowered to sub-basement through one of the elevator hatches. All the plastering material was handled through the basement.

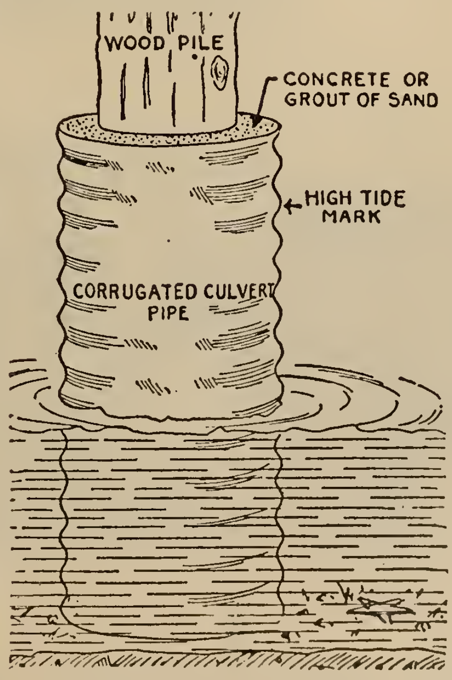
At times it taxed our limited storage space inside the building but we were able to keep everything entirely off the street and due to this fact the police and highway departments have given us every consideration.

Joseph F. Kuntz of Pittsburgh, Pa., was the architect. The writer represented both architect and owner on the job. Metzger, Fisher & White of Philadelphia were the general contractors with A. Erickson, superintendent.

Culvert Pipe Protects Wooden Piling

The teredo, a wood-boring shipworm, has long presented serious problems to railroads and industries along the Atlantic and Pacific coast lines where wharf building is a commercial necessity.

The worm grows to a length of from four to ten inches, and possesses a tiny and very effective boring shell at his "head." Wooden piling has been found to be excavated by teredo to the degree of 45.5 per cent, while almost complete destruction frequently occurs within the period of a hundred days.



How wooden piling may be protected from marine woodborers by incasing with corrugated iron culvert pipe

The problem is a difficult one. The teredo, multiplying at the rate of many millions in a season, is so tiny that his presence is hardly suspected until a piling gives away. He bores almost vertically through the wood, taking care to seldom cross his own path, thus insuring a very complete excavation of the piling.

Since the worm thrives in salt water, the means of combating it is consequently more problematical; for the question of obtaining a piling protection that will resist the action of salt water, must be a paramount consideration.

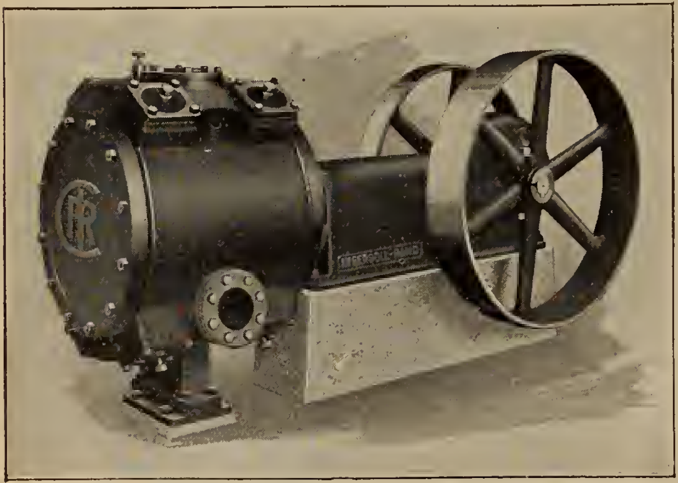
To the end that wood as well as concrete coated piles may also be protected, corrugated galvanized culvert pipe has been adopted by some progressive dock owners. The manner in which this is applied is indicated in the sketch and the method is said to be very effective.

Machinery & Equipment

New Line of Dry Vacuum Pumps Possesses Many Unique Features

A new line of steam and belt-driven dry vacuum pumps has recently been placed on the market by the Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal, P. Q. The belt-driven units are known as the class "ER-1," and the steam-driven machines as the class "FR-1" type. They are similar to this company's "ER" and "FR" air and gas compressors and like the latter, are of the single stage, straight-line, centre crank, dust and dirt-proof type with automatic lubrication of both running parts and vacuum ends.

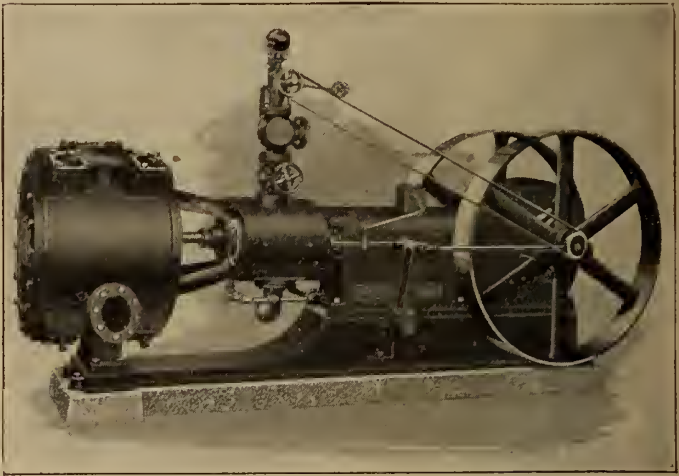
They embody every refinement of modern vacuum pump design, including a number of features which make them as nearly automatic in action as any machine of this type can be expected to be. This is an important consideration in any vacuum pump, but is even more essential in the case of small and medium sized units which are often operated in isolated locations where but little attention can be given them.


Ingersoll-Rand Class "ER" Belt Driven Dry Vacuum Pump

The class FR-1 vacuum pump consists of a plate-valved vacuum cylinder, direct-connected to a steam engine with balanced piston valve, a design which makes it possible to operate with high pressure and superheated steam as well as the moderate pressures more common in the past.

The main frame of both types, is of the enclosed design, the bottom part forming a reservoir for the combined splash and flood lubricating system. It is fitted with easily removable side and crank end covers. The cross-head guides are of the bored type and the design of the frame provides for an oil stuffing box near the cylinder end of the frame, which prevents any chance of crank case oil entering the vacuum cylinder. On the class FR-1 type adjustment of stuffing boxes when running is provided for.

The main frame and truck piece of the steam-driven units are mounted on a substantial cast iron subbase which lends rigidity to the entire structure, makes the machine a complete, self-contained, accurately aligned unit, and also forms a support for the single rocker arm which guides the valve rod. There are no guide blocks or other sliding surfaces in the piston valve gear.


Ingersoll-Rand Steam Driven Dry Vacuum Pump

The main bearings are of very heavy construction and provided with removal die-cast shells or liners of genuine babbitt metal which can be removed and renewed in a few seconds, at small cost.

The crank-shaft and connector rods are solid one-piece drop forgings, accurately machined and heat-treated. The connecting rod is of the solid end type with renewable and adjustable boxes in both cross-head and crank pin ends. The crosshead is of the cylindrical type, of box construction with adjustable bored and turned shoes. Pistons are of the box type with broad faces and are securely fastened to a turned and ground steel rod.

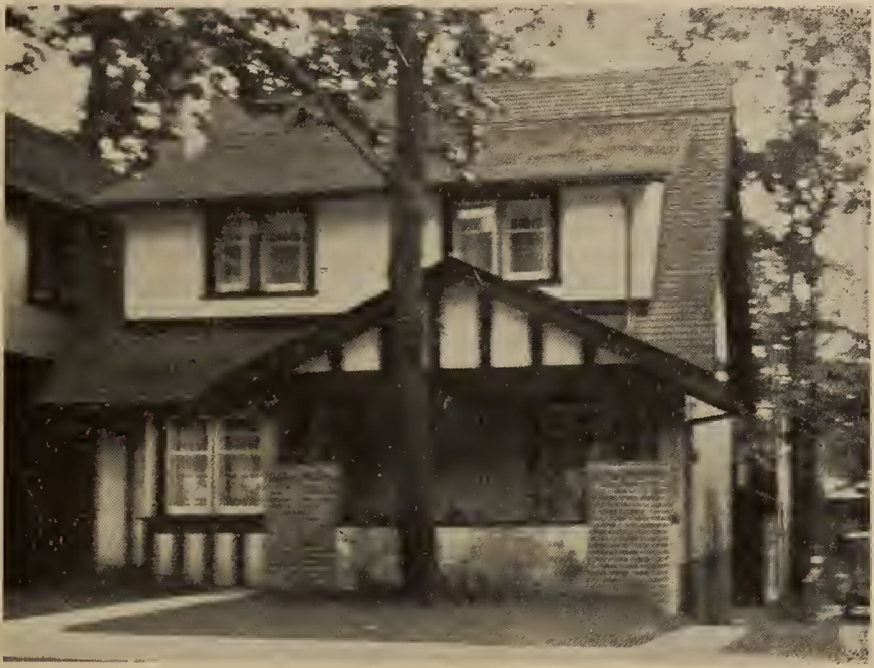
Oil is distributed to all of the running parts by throwers on the crank webs which lift or throw the oil against baffles from which it runs to all wearing surfaces. Lubrication of steam and vacuum cylinders is provided for by a double compartment, adjustable sight feed, mechanically operated lubricator.

The class "ER-1" belt-driven units are furnished for either long or short belt drive. The latter arrangement is generally preferred as it not only saves floor space but also increases the arc of belt contact and reduces belt wear and bearing load.

Both classes of these machines are built in four sizes with piston displacements of about 500 to 2,300 feet per minute. With closed intakes they will pull up to 1.0 inch absolute, or 29 inches when referred to a 30 inch barometer, this vacuum differing, of course, with the size and stroke of the pump.

The Contract Record's

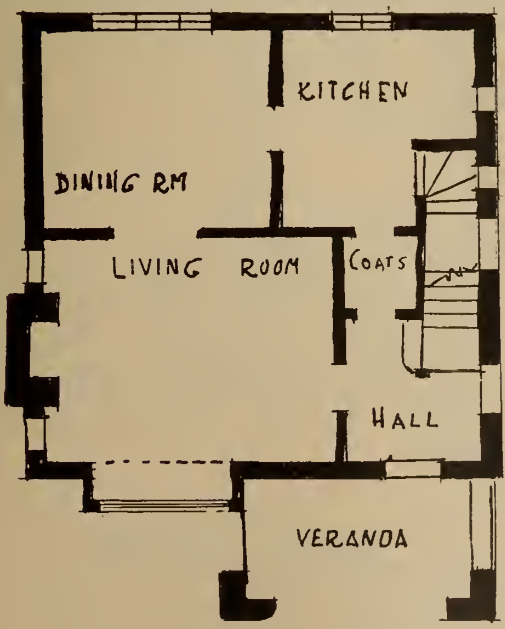
Weekly House Suggestion No. 88

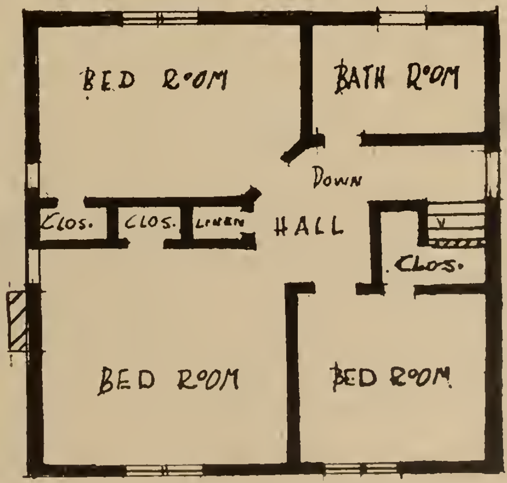


Many of the homes built in different sections of Toronto, by Mr. H. Addison Johnston, incorporate the handsome feature of half-timbering in the exterior trim and the subject of our article this week, built by Mr. Johnston on Duart Park Rd., Toronto, is an excellent example of the pleasing effect that can be obtained with this type of construction on stucco.

The layout of the interior is simple and convenient in this house. All the rooms are of good size, the living room being especially large and equipped with handsome fireplace and large bay window giving plenty of natural light to the interior. The kitchen contains built-in refrigerator and cupboards. The trim throughout is of chestnut and the flooring is oak.

There are three good-sized bedrooms and bathroom upstairs, conveniently arranged and well provided with closet space. Flooring here is of oak and trim chestnut, as downstairs.





Mainly Constructional

East and West—From Coast to Coast

The British Columbia executive of the Trades and Labor Congress of Canada recently asked the provincial government to make the proposed eight-hour bill applicable to each and every industry in the province.

A recent news item states that Mr. Henry Ford is trying to secure a Quebec site for the establishment of another factory. Several cities have been investigated, but no decision has been reached yet. Quebec city has offered the Lauzon Engineering premises, where there already exists a large factory building.

Supplementary letters patent have been issued changing the corporate name of Engineering & Inspection Co., Ltd. to General Inspection & Engineering Co., Ltd.

The name of the Winnipeg Brick Company, Ltd., at Winnipeg, is being changed to the Winnipeg Brick & Fuel Co., Ltd.

Financing of the proposed $3,000,000 steel plant for the Dominion Alloy Steel Corporation, at Sarnia, is progressing favorably. The first million capitalization has been subscribed in Sarnia and Lambton county and the remaining $2,000,000 has been underwritten by F. G. Warner, of Pontiac, Mich. The factory is to be erected on property already provided, south of Sarnia.

Port Arthur's building permits to the end of October show a total of $2,632,055, according to figures made public by the Building Permit Branch of the City Engineer's Office. The total exceeds by almost a quarter of a million the figures of Port Arthur's one other big year, 1912, when the total gave the City a record for building.

Present indications are that a start will be made on the joint filtration scheme for the Border Cities this winter. The Border Utilities Commission has been granted permission by the Canadian National Railways to use the latter's right of way from Strabane Ave., Ford City, to Walkerville and Windsor water works, for the main which will deliver filtered water to the pumping station. Plans will be ready shortly and, as this work would greatly relieve the shortage of work during the winter months, there is every likelihood that it will be proceeded with.

Construction of the Kenogami dams by the Quebec Running Streams Commission is being temporarily delayed by the disinclination of the residents of St. Cyrian parish, whose land will be submerged by the dams, to accept the commission's offers for the property. The total cost of the land, plus the indemnities which the commission will pay, will total about $1,000,000. The commission has placed at the disposal of the residents 800 acres of land on the heights, a short distance from the present village. The commissioners expect to persuade the residents to come to terms without having to resort to expropriation proceedings. It is expected that fifteen months will see the $2,000,000 project completed.

A circular letter has been sent by the secretary of the Montreal Trades and Labor Council, Mr. G. Francq, to a number of the trade organizations and national societies of Montreal in an effort to enlist their support for two measures advocated at their recent meeting, namely the construction of a new bridge across the St. Lawrence, to connect the city of Montreal with the South Shore, and the grave need of a suitable waiting room and public lavatories at Place D'Armes, which is now the main transfer point of the tramways service.

With the object of helping Quebec municipalities, which have gravel roads within their limits, to maintain them in good condition a circular letter, signed by Mr. J. L. Boulanger, deputy minister of roads, was forwarded recently to five hundred municipal councils, containing advice regarding the maintenance of the roads and means to preserve them in a good state by certain processes, both before the snowfall and early in the spring. Economical systems of keeping these roads in good order for a longer period are suggested in the letter and experiments conducted by the engineers of the Department of Roads are recorded as examples. Mr. Boulanger went to New York recently to study modern systems in use for the maintenance of roads and also to see what improvements may be made in the execution of the 1924 road programme, which promises to be as extensive as the one which is now practically completed.

The provincial prime ministers at the inter-provincial conference on good roads which was held at Quebec on October 9 and 10, decided that a meeting should be called by the executive committee of the Canadian Good Roads' Association of representatives of Highways Departments of all provinces to discuss important questions relating to uniformity of highways laws and regulations. It was suggested that each Minister of Highways should nominate such deputy ministers, engineers, and other officials as in his opinion are primarily responsible for the administration of highways and motor vehicle laws. At a meeting of the executive committee of the Canadian Good Roads' Association, held at Toronto a few days ago, it was decided to hold this meeting at Winnipeg on Monday, December 3rd next.

About fifteen million dollars on good roads construction will have been spent when the season ends this month. Of this total about five millions have been spent in Ontario, four in Quebec, two millions in the West, apart from Alberta, and a million and a half in the lower provinces. Alberta has not yet drawn on the Federal funds from which are contributed forty per cent of the total incurred by the provinces. The time for availing of the $20,000,000 grant has been extended to 1926, but the Government is not disposed to make a further appropriation.

Personal

Mr. R. G. Bunyard, of Moose Jaw, was recently elected president of the Saskatchewan Architects' Association.

Mr. F. A. Combe, a prominent Montreal steam and combustion engineer, has been engaged by the Dominion Government to make an exhaustive report on the feasibility of establishnig central heating plants in Canada. Mr. Combe's investigations will be conducted under the supervision of the Dominion Fuel Board and it is stipulated in his agreement that his report must be completed in six months' time.

Obituary

The death took place, at Seattle, Wash., on October 26th, of Mr. P. E. Fisher, president of Pacific Coast Pipe Co. Ltd., Vancouver, B. C. Mr. Fisher was born in New York 57 years ago and went west 20 years ago. He founded the Pacific Coast Pipe Co. in Vancouver in 1904, and similar companies in Spokane and Seattle, and later in Portland, Ore. About ten years ago he disposed of his pipe plants in the United States and centred his activities on the plant at Vancouver.

Trade Incorporations

Constructors' Company, Limited, with head office at Montreal, capital $20,000, to carry on a building business.

A recent issue of the Canada Gazette contains notices of the incorporation of the Town Planning Institute of Canada, with head office at Ottawa.

CONSTRUCTIONAL ACTIVITY

Period of November 7 to November 13, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Alfred Twp., Ont.

Tenders are being received till November 15. by the Prescott County Council, through the county road superintendent, F. A. Senecal, Plantagenet, Ont., for supply of 3,000 cu. yds. of stone, and also construction of road about 1 mile south of Alfred station. A 5% marked cheque required.

Burlington, Ont.

MacKay & MacKay, engineers, Hamilton, are preparing plans for sewers on Ontario St., from Brant street to Maple Ave.

Plans are being prepared for laying of watermains on Morris Ave. Engineers in charge are McKay & MacKay, Home Bank Bldg., Hamilton, Ont.

Hamilton, Ont.

The laying of watermains on King street, from Sterling street to Haddon, is contemplated. W. L. McFaul is the engineer in charge.

The city council contemplate laying concrete sidewalks on Aberdeen Ave., from present walk to Canadian Westinghouse. Engineer in charge is W. L. McFaul.

The city council contemplate a sewage disposal system. By-law will be submitted next January and if passed, this work to start next year. Engineer in charge is W. L. McFaul.

Niagara Falls, Ont.

Lower Steel Arch Bridge Co. contemplate widening Bridge St. and River Road at a cost of $174,000. H. G. Dickenson, Niagara Falls, Ont., is the superintendent.

St. Thomas, Ont.

The town council is having plans prepared for the erection of a sewage disposal plant. Engineer is Mr. W. C. Miller.

Stratford, Ont

The city council contemplate the laying of sewers and watermains on William St. from James to Dawson St. Superintendent, Mr. Myers, of Public Utilities Commission will take charge of watermain, and engineer, A. B. Manson, will make survey of sewer. This work is not expected to start this year.

Toronto, Ont.

Tenders are being received till November 20 by C. A. Maguire, chairman Board of Control, for construction of sewers in following Sts.; Bodwin Ave.; Strathmore Blvd.; lane 1st. west of Parkway Ave.; lane 1st. north of St. Clair Ave., College St.-Rusholme Rd. to Havelock St. Also laying and jointing of 6 in. water pipes on Indian Grove,

Tenders are being received till January 15, by C. A. Maguire, chairman Board of Control, for the following: tender No. 57, 1 only air compressor; tender No. 58, 1 only 3,000,000 imperial gallon centrifugal sludge pump and motor. Specifications at Works Dept., Room 12, city hall.

CONTRACTS AWARDED

Edmonton, Alta.

The city of Edmonton has awarded the general contract for watermains to R. A. Hulbert, 10013 83rd Ave., at $5,277.20.

Fort Erie, Ont.

The town council has awarded the general contract for $50,000 sewage system to F. F. Fry Limited, 43 Scott St., Toronto. Engineers are James Proctor & Redfern, Excelsior Life Bldg., Toronto.

Hanna, Alta.

W. S. Tomlinson, 303 Confederation Life Bldg., Winnipeg, Man., has the general contract for raising dam and spillway costing $15,000, for the Canadian National Railways.

Three Rivers, Que.

Wabasso Cotton Mills Co., Ltd., have awarded the general contract for $8,00 water main, to Germain & Freres, 87 St. Antoine St. Pipe is being supplied by Canada Iron Foundries Ltd.

Toronto, Ont.

The following contracts have been awarded by the city of Toronto in connection with Rosedale Heights drainage system; Rosedale Heights—J. H. McKnight Construction Co., Ltd., at $4,960; Errington and Hudson Aves— Angeio Cavotti, 257 Euclid Ave., at $3,145.

York Twp., Ont.

The township council has awarded the following contracts for watermains. Avon Ave., $600, Newman Ave. $250.—J. McAdam, 45 Jarvis St.; Foxwell Ave., $1,500—Murphy Contracting Co.; Balfour Ave., $600, Eglinton Ave. $675.00, Eglinton Division $800, Grey Ave., $700, Luke St., $400, Madison Ave. and Clark St., $1,500, Roseberry Ave., $1,350, Willard Ave., $750—Atlas Construction Co., Toronto. F. B. Goedike, 40 Jarvis St., Toronto, is the engineer.

Railroads, Bridges and Wharves

Pembroke, Ont.

The erection of a bridge at St. Mary street, to cost $75,000 is contemplated by the town council. Bridge will consist of three 90 ft. steel spans. A by-law will be submitted to the ratepayers on January 1, 1924.

Province of Ontario

Tenders are being received till November 26 by E. W. Oliver, general manager of Electric Lines Dept., C.N. Rlys., 1 Toronto St., Toronto, Ont., for rebuilding trestles in localities of "A" Whitby; "B" Oshawa, "C" Bowmanville. Plans and specifications with general manager and resident engineer, Toronto Eastern Railway, Oshawa, Ont.

CONTRACTS AWARDED

Lyons Brooks, N. S.

Provincial Highway Board, Halifax, has awarded the contract for a bridge to Gavin Munro. Chief engineer in charge is W. A. Hendry, Parliament Bldgs., Halifax.

Scotsburn, N. S.

The contract for bridge on Scotsburn-Durham Road, has been awarded to John Liethead, Scotsburn.

Sturgeon Falls, Ont.

Thos. B. Charleson, 179 Gilmour St., Ottawa, Ont., has the general contract for public wharf at $8,660.

Sicamous, B. C.

N. A. Cain, Lombard Bldg., Winnipeg, Man., has the general contract for remodelling C.P.R. Bridge here, at $6,500. Timber truss railway bridge to have new abutments and span will be heavily re-inforced with steel girders.

Public Buildings, Churches and Schools

Capreol, Ont.

The foundations are in for $5,000 church being built on Young St., for Anglican Congregation. H. H. Heard is the rector.

Guelph, Ont.

New tenders will be called in January for alterations and addition to St. Josephs Hospital. Architects, Stevens & Lee, 62 Charles St. E., Toronto.

London, Ont.

Tenders will be received till November 28 by Bishop Fallon, the Palace, in connection with $500,000 seminary to be built for St. Peters Seminary, Dufferin Ave. Architects are Pennington & Boyde, Bartlet Bldg., Windsor, Ont. Plans and specifications with architect and bishop.

Langford, B. C.

Tenders are now being called by Rev. H. Pearson, of Langford, B. C., for a $5,000 church to be built for Anglican Church Congregation. No closing date set. Architect is K. B. Spurgin, Sayward Bldg., Victoria, B. C.

Montreal, Que.

E. A. Doucet, 195 Catherine East, is preparing plans of public hall and office building for Debardeurs Syndiques Du

Port De Montreal. Tenders will be called in about one month.

Pembroke, Ont.
Th town council contemplate building a $23,000 fire hall. By-law will be submitted to the ratepayers in January 1924.

St. Leon de Standon, Que.
Pierre Levesque, 115 St. John St., Quebec City, is preparing plans for interior decoration, plaster and hardwood trimming for R. C. church here, to cost $20,000. Tenders for this work will shortly be called.

Strathroy, Ont.
W. G. Murray, Dominion Savings Bldg., is preparing plans for $25,000 addition to hospital here. Tenders will not be called before spring.

Tillsonburg, Ont.
Tenders are being received by the town council, through the chairman, W. H. Jackson, for the erection of a market building. Plans and specifications with the chairman.

CONTRACTS AWARDED

Chaplin, Sask.
The general contract for $8,647 school to be built here has been awarded to Poole Construction Co., Ltd., Regina Sask.

Kingston, Ont.
The contract for structural steel for $103,000 addition to dormitory for Royal Military College, has been awarded to Disher Steel Construction Co., Ltd., Toronto, Ont.

Long Branch, Ont.
The general contract for building fire station has been awarded to Sol Waller, Long Branch, Ont., who buys all material. Roofing, plastering, painting, heating, plumbing and electric to be let.

Lambton Mills, Ont.
General contract for building fire station here has been awarded to Fred Barrett, Lambton Mills, who buys all material. Roofing, plastering, painting heating, plumbing and electric to be let.

Sussex, N. B.
Contracts on clerical work on $28,000 Memorial Hall, and $5,000 repairs to post office, have been awarded to W. A. Haley, of Sussex, N. B.

St. Ignace, Que.
Anselme Dube Ltd., Three Rivers, Que., have the general contract for rebuilding of church for the Roman Catholic congregation.

Sault Ste. Marie, Ont.
The foundations are in for $9,000 mission for Presbyterian church. Following sub-trades have been let: electric—Taylor Bros.; plumbing—J. McLeod; heating—Lockhart Bros.; plastering—Wm. Murdock; painting—Clement & Bennett. McIntyre & Kelly Bros., are the general contractors. Architects, Findlay & Foulis.

Sarnia, Ont.
The following sub-trades have been let on $25,000 sunday school for Anglican Congregation; general contract—Jas. Shank & Sons: electric—Chambers Electric Co.; masonry—A. E. McDonald; structural steel—Sarnia Bridge Co.

The walls are going up for $18,000 curling rink for Sarnia Curling Club, Ltd. Electric—Chambers Electric Co.; sheet metal—MacKenzie, Milne & Co. Thos. Grase, S. Christina St., is the builder. Architect, Chester Woods, N. Christina street.

Three Rivers, Que.
Germain & Freres, 87 St. Antoine St., have the contract for plumbing in $25,000 school being built for R. C. School commission. General contractors are A. Dube & Cie.

Business Buildings and Industrial Plants

Burlington, Ont.
Advertising Display Co., 34 Britain St., Toronto, Ont., contemplate building a factory here.

Hamilton, Ont.
Husband & Robertson, Bank of Montreal Chambers, are preparing plans for a warehouse foot of Wellington St., owned by the Hamilton Harbor Board.

London, Ont.
A. M. Piper, architect, city hall, is preparing plans for $7,000 market pavilion.

Montreal, Que.
Wilfred Lacrois, Quebec, Que., is preparing plans for $6,000,000 hotel to be built on Dorchester St. West.

Niagara Falls, Ont.
Plans are being prepared for $15,000 and $5,000 office buildings on River Road, for the Lower Steel Arch Bridge Co. Tenders for this work will be called in the spring.

Rapid City, Man.
Macaw & McDonald, 711 Paris Bldg., Winnipeg, have the general contract for addition to dairy of T. Eaton Co., Ltd., Winnipeg. Owners will supply materials and do the electrical work. General contractor will let other sub-trades.

Sault Ste. Marie, Ont.
P. Larmon, 139 James St., contemplates building $8,000 store block on James St. 2 storeys, 25x40, brick construction. This work will go ahead in the spring.

Sapperton, B. C.
Work is to start at once for three packing plant buildings for Swift Canadian Co., Ltd., at a cost of $250,000.

Sydney, N. S.
Gunns Ltd., of Toronto, Ont., are having plans drawn for $8,000 meat and provision warehouse to be erected here.

Toronto, Ont.
Work is now in progress on alterations to store for cafeteria, 185 Yonge St. Painting and flooring trades to be let. N. A. Armstrong Co., Ltd., 7 King East, are the architects.

Vancouver, B. C.
Downing & Kayll, 590 Seymour St., are preparing plans for $25,000 cafe to be built on Seymour St., for Pemberton & Sons, 418 Homer St. Tenders for this work will be called soon.

CONTRACTS AWARDED

Brantford, Ont.
Thos. Minnis, 9 King St., has the contract for electrical work, and Turnbull & Cutliffe, 50 Colborne, the contract for roofing in connection with $15,000 warehouse, office and garage for British American Oil Co., Ltd. General contractors are P. H. Secord & Sons Construction Co., Brantford. Consulting engineer is W. A. T. Schorman, care British American Oil Co., Ltd.

Brampton, Ont.
John Patterson has the contract for foundations for $150,000 factory building being built on Queen E. for Beaver Truck Corporation, Ltd., of Hamilton.

H. E. Heathley has the contract for cement work, and Giles & Son the contract for brickwork in connection with $10,000 addition to factory owned by Gummed Papers Co. Architect, R. W. Hall, Jr., Brampton.

Capreol, Ont.
The walls are going up for $8,000 theatre on Yonge St., owned by W. Plexman. Capreol Lumber Co. have the general contract.

Corbyville, Ont.
The following sub-trades have been let on $225,000 distillery buildings being built for Canadian Industrial Alcohol, Ltd.; fire shutters—W. G. Edge, Ltd., Toronto; sash operator—Lord & Burnham Co., Ltd., Toronto. Engineers are T. Pringle & Son, Ltd., Montreal. Structural steel to be erected by general contractors, A. F. Byers & Co., Ltd., Montreal, by day labor.

Dixie, Que.
J. H. Salisbury, 357 Walkley, has been awarded the general contract for $48,000 club house for the Summerlea Golf Club, Montreal. Architect, C. R. Tetley, 314 Hall Hill, Montreal.

Hamilton, Ont.
Work as just started for coal bins and alterations costing $10,000 for the Ferrey Coal Co., Ltd. Canadian Engineering & Contracting Co., Ltd., have the contract for concrete work; carpentry—M. T. Dawson, 254 St. Clair Ave.

Laval Sur Le Lac, Que.
Collet & Freres, Ltd., Montreal, have the general contract for alterations and addition to club house of Laval Sur Le Lac Club.

Montreal, Que.
Pouring concrete 2nd floor is being done on $1,100,000 office building on Bleury St., between Ontario and Sherbrooke. O. Archambault, 610 Lafontaine Park is the general contractor. Plumbing and heating—Conry Bros., 291 Centre St.; elevators—Otis Fensom Elevator Co., Ltd. Architects, McVicar & Herior, 628 Union Ave.

Montreal, Que.
Montreal Architectural Iron Works, Ltd., have the contract for ornamental iron for $500,000 offices and warehouse being built on Ontario St. E. owned by Federal Construction, Ltd.

Forgues & Guay, 83 Craig St. W., have the contract for reinforced steel for $125,000 office building on Victoria Pier, for the Harbor Commission. Architect, T. Daoust, 61 St. James St. General contractors are Colles & Freres, 243 St. Hubert St. Roofing, plastering and elevators to be let.

Nanaimo, B. C.

Work is to start at once for $6,500 creamery owned by Nanaimo Creamery Association. Cameron Construction Co., 832 Hornby St., are the general contractors. Architect, Sol. Cameron.

Outremont, Que.

Perreault & Gadbois, 2100 Park Ave., are the architects of $250,000 public garage north west corner Bernard and De L'Epee, for J. O. Villeneuve & Co., 763 Bloomfield. General contractors are Guidazio & Besozzi.

Quebec, Que.

Arthur Poulin, 249 St. Oliver St., has the general contract for the addition of third floor to branch bank of La Bank D' Hochelaga, on Ste. Marie St., costing $6,500.

Sarnia, Ont.

W. Cook, care Sarnia Brokers, has the general contract for $5,000 store and club rooms being built on N. Christina St., for United Slub, Ltd. Masonry—Thos. Grace; millwork—Laidlay Belton Lumber Co.

Sussex, N. B.

W. A. Haley has the contract for electrical work on $12,000 store being built here.

Sault Ste. Marie, Ont.

The following sub-trades have been let on $10,000 store block being built on Queen St., owned by Harry Yates; plumbing and heating—Geo. Woolrich; electric—O. C. Carney; painting—M. C. Callahan. Plastering to be let. McLarty Bros., 38 Wellington St., are the general contractors.

Three Rivers, Que.

The contract for pipe fitting for $7,000 aero plant being built on Notre Dame St., for Laurentide Air Service, has been let to Germain & Freres.

Toronto, Ont.

The contract for structural steel for paint plant being built south west corner Phoebe and Soho Sts., for R. Elder Carriage Works, Ltd., has been awarded to Disher Steel Construction Co., Ltd., and not Hepburn & Disher, Ltd., as previously reported.

The footings are completed for $50,000 ice plant of Chapmans Ltd. Following contracts have been awarded; structural steel and ornamental iron—McGregor & McIntyre, Ltd.; waterproofing—Vulcan Asphalt & Supply Ltd.; steel sash—Canadian Metal Window & Steel Products, Ltd.; roofing and sheet metal—E. Lankin & Son, Ltd.; plastering—E. A. Morby, 209 DeGrassi St.; painting—Jas. Casey, 30 Dalhousie St.; insulation work—Armstrong Cork & Insulation Co., Ltd. Electric, plumbing and heating to be let by general contractors, Witchall & Son, 156 St. Helens Ave. Architects, Chapman & Oxley.

The following sub-trades have been let on $15 000 addition to garage, rear 621 Yonge St., for Jos. H. Doane, 30 Isabella St.; electric—F. Phillips, 198 Gledhill Ave.; glazing—Excelsior Plate Glass Co., Ltd.; painting to be let. Robert Page, 18 Toronto St., is the general contractor.

The walls are going up in connection with rebuilding of club house at Sunnyside. The following trades have been let; structural steel—McGregor & McIntyre Ltd.; reinforced concrete—Geo. D. Lovegrove, 18 High Park Ave. Tenders are being received till November 17 by the architects, Molesworth, West & Secord, 43 Victoria St., Toronto, Ont., for carpentry work in connection with the superstructure of the main building.

Excavating work is being done for $50,000 addition to warehouse at 2 Bulwer St., for L. Yolles, 379 Queen W. Masonry—Toronto Bricklayers Co.; carpentry—A. Osher, 4 Bellevue Ave.; steel factory sash—H. C. Lefroy Engineering Co. Owner buys all material and will let heating, plastering, plumbing and electric trades. Architect, Kirk Hyslop, 10 Sparkhall Ave.

Drummond Bros., 540 King West, have the contract for painting in connection with $20,000 alterations to garage for Parkdale Motors. N. A. Armstrong Co., Ltd., are the architects.

Vancouver, B. C.

Dominion Construction Co., Ltd., Vancouver, have the general contract for remodelling factory of B. C. Sugar Refinery Co., at $6,000.

Foundations are going in for $550,000 apartment block corner Georgia and Hornby Sts. The following sub-trades have been let; carpentry and millwork—Jas. Brookes Woodworking Co., New Westminster, at $32,000; roofing and sheet metal—Pacific Sheet Metal Works, Granville Island, at $10,000; 2 elevators—Otis-Fensom Elevator Co., Ltd., at $11,000. General contractors are Smith Bros. & Wilson. Architects, McCarter & Nairne.

The following sub-trades have been let on $9,500 show room and garage at 1266 Granville St., being built for Henry Hoffmeister, 1234 Burrard St.; roofing and sheet metal—Campbell & Grill, 1238 Seymour St.; plumbing—Townsley & Son; ornamental and miscellaneous iron—Ross & Howard. Architect and general contractor, Bedford Davidson, 1012 Boughton St.

Victoria, B. C.

K. M. Skene, Wharf St., has the general contract for $15,000 repairs to warehouse of Pither & Leiser.

Winnipeg, Man.

Carter-Halls-Aldinger Co., Winnipeg, have the general contract for $5,000 alterations to store of Hudson Bay Co., Main and York Sts. General contractors will purchase materials and sub-let trades.

Langford & Birch, 814 Jubilee Ave., are the general contractors for $30,000 repairs to office building at 63 Albert St., owned by F. W. Hammond. Owners will purchase materials and sub-let trades.

Residences

Capreol, Ont.

The walls are going up for $20,000 store and residence being built for A. Nepitt, who buys material.

Hamilton, Ont.

N. M. Sweet, 383 Ottawa N., is the owner and builder of 2 residences, $5,000 on Houghton Ave. 1 storey frame construction.

Work has just started on $4,500 residence being built on Edgeville Rd. Cartridge & Steer, 32 Balsam N., are the owners and general contractors and will let trades.

Work has just started for $15,000 store and apartments on Main St., corner Gage. H. Johnston, Mount Pleasant, Ont., is the owner and general contractor and will let trades.

London, Ont.

F. B. Kilbourne, 3 Cove Rd., is the owner and general contractor of $4,000 residence on Orchard St., and is interested in prices on all material except concrete blocks.

Moncton, N. B.

Moncton Construction Co. are the owners and builders of $5,000 residence on West St., north of John St. No material purchased. Plumbing, heating and electric to be let.

Montreal, Que.

D. Deluca, 1795 De La Roche, is the owner and builder of $8,500 residence, near 1795 De La Roche. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

T. A. Dunet, 918 Carriere, is the owner and builder of $10,000 residence on Parthenais, near Carriere. Carpentry day labor. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let.

The foundations are going in for $6,500 residence on 4th Ave., between Masson and Dandurand. L. Bellerose, 466 Second Ave., Ros., is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

The foundations are going in for $7,000 residence on 4th Ave., between Masson and St. Jerome. E. Cournoyer, 2955 Fouth Ave., Ros., is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

The foundations are going in for $8,000 residence on Joliette, between St. Catherine and Adam. W. Labonte, 138 Darling, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

O. Chabot, 219 Christophe Colomb is the owner and builder of 3 residences, $14,000, on Patricia, between Somerled and Western. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Ottawa, Ont.

The foundations are in for $6,000 residence on Flora St. Caleb Brookes, 590 Driveway, is the owner and general contractor and is receiving tenders till November 24 for electric, plumbing, heating and plastering. Balance of work by day labor.

The foundations are in for $7,000 residence on Willard Ave. Tenders are being received till November 16 by the owner and general contractor, F. G. Bowie, 16 Pretoria Ave., for plumbing, heating, painting and plastering.

Weston & Keeney, 67 Prince Albert St., Overbrook, near Ottawa, are the owners and general contractors of $5,000 residence on Marlow Cres. 9,000 bricks

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for Steel Bridge

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Thursday, November 22, 1923,

for the construction of the super-structure of the bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The bridge consists of a 100′ Bascule Double Leaf Span with steel approach spans of 98′ and 158′ and the work includes a Creosote block floor on the Bascule span and concrete floors on the approach spans.

Plans and specifications and form of tender and contract may be seen at the office of the undersigned, Chatham, Ont. A set of plans and specifications may be had by depositing Twenty-five ($25.00) Dollars with the undersigned, which amount will be returned when the plans are returned if a bona fide tender is put in by the party obtaining the plans.

Tenders must be accompanied by marked cheques for at least five percent of the amounts of the tenders.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C. E.
County Engineer.

43-46

Canadian National Railways

Electric Lines

Toronto Eastern Railway

Tenders for Trestles

Sealed tenders will be received at the office of the undersignd until the **26th** day of November, **1923**, for Rebuilding of Trestles in the following localities:—

"A" at Whitby, "B" at Oshawa, "C" at Bowmanville.

Plans, specifications, and blank forms of contract may be seen at office of Resident Engineer, Toronto Eastern Railway, Oshawa, and at office of the Manager, No. 1 Toronto Street, Toronto.

All conditions of the Specifications and Contract must be complied with.

Tenders must be on blank form of tender which may be obtained from any of the offices at which plans are on exhibition. Tenders may be submitted for one or all of the locations, but a separate tender form must be submitted for the work at each location.

Each tender form must be accompanied by an Accepted Bank Cheque payable to the Canadian National Railways for an amount as follows:-

"A" at Whitby	$200.00
"B" at Oshawa	600.00
"C" at Bowanville	400.00

Lowest or any tender not necessarily accepted.

E. W. OLIVER,
Manager, Toronto Eastern Railway,
TORONTO, Ont.

Toronto, November 5th, 1923. 45-46

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. **Niagara Falls**

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Notice

To Sculptors, Architects and Artists

The Government of Canada propose erecting in the Parliament Grounds at Ottawa a monument to the memory of the late Sir Wilfrid Laurier.

Parties are invited to submit designs in the form of sketch models in plaster made at a uniform scale of 1½ inches to the foot.

The design must take the form of a portrait statue.

The competition is open to architects, artists or sculptors throughout the world. The Minister of Public Works, however, reserves the right other things being equal to give preference to architects, artists or sculptors of British birth resident in the British Empire or elsewhere.

The author of the best design who is awarded first place, will be given the commission of the work, and the author of the second best will be awarded a prize of One Thousand Dollars ($1,000.00).

The memorial, including pedestal above the level of the ground, when completed and in position, is not to cost more than Twenty-Five Thousand Dollars, ($25,000.00).

The designs must be addressed to and received by Mr. Eric Brown, Director of the National Art Gallery of Canada, Victoria Museum, Ottawa, Canada, not later than the 2nd day of April, 1924.

Copies of the conditions, etc., and photographs may be obtained on application at the office of the Secretary of the Department of Public Works, Room 784, Hunter Building, Ottawa.

Parties who intend to compete should notify, at once, the undersigned of their intention to do so.

By order,
L. H. COLMAN,
Secretary.

Department of Public Works, Canada.
Ottawa, October 24, 1923. 44 and 46

Steel Sheet Piling for Sale

214 Pieces New Lackawanna Steel Sheet Piling 18 feet long, 14″ x 3/8″ Arch Web, Weight 40.8 lbs. per lineal foot.
Second Hand Lackawanna Steel Sheet Piling Same Section and weight—good condition.
109 Pieces—15 to 25 feet long.
102 Pieces—20 feet long.
8 Corners—20 feet each.

PORT ARTHUR CONSTRUCTION CO., LTD.
611 Excelsior Life Bldg., Toronto.

44-45

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same.

Box No. 407, Contract Record, Toronto. 44 T.f.

Dump Cars and Locomotive For Sale

6—16 yard Western air dump cars, wood bottom, steel sides and steel lined bottom, now in use at Port Weller, Ontario, on the Welland Ship Canal, hauling sand only, are nearly new and in first class condition.

Pennsylvania Switching engine, type 0-4-0, 144-2″ diam. tubes, boiler pressure 160 lb., cylinders 17″ x 24″, electric head lights front and rear, driving wheel 44″ diam., brake and straight air for dumping cars, tender 2700 gallons, coal 8000 lbs., weight 40 tons.

The above plant now in use and will be sold subject to delivery F.O.B. tracks Merritton, about November 20th, 1923.

National Sand and Material Co., Limited

Welland, Ontario

44-46

City of Niagara Falls, Ont.

Tenders for Sewer Work

Tenders, properly marked, will be received at the office of the City Clerk till noon,

Monday, November 19th, 1923,

for Sewer Excavation, Pipe Laying and Backfiling as follows:

Earth Excavation, approximately 2,700 cu. yds.
Rock Excavation, approximately 100 cu. yds.
Bid by Cubic Yard, including backfill.
Lay 15″ Pipe, 566 Lin. Feet, approximately
Lay 18″ Pipe, 232 Lin. Feet, approximately
Lay 24″ Pipe, 1404 Lin. Feet approximately
Bid by Lin. Foot.

Marked cheque for 5% of Tender must be attached.

Lowest or any tender not necessarily accepted.

Particulars at office of City Manager.

T. S. SCOTT,
City Manager.

46

CITY OF TORONTO

TENDERS

Air Compressor and Sludge Pump and Motor

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall,, Toronto, up to 12 o'clock noon,

Tuesday, January 15th, 1924,

for the following:

Tender No. 57—One only Air Compressor.
Tender No. 58—One only three-million Imperial Gallon Centrifugal Sludge Pump and motor.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specification and Form of Tender may be obtained at the Works Department, Room 12, City Hall, Toronto. Tenders must comply strictly with the conditions of City By-law as to deposits and sureties, as set out in Specification and Form of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE (Mayor)
46 Chairman, Board of Control.

Residences

(Continued from page 53)

and material for 30 cu. yds. concrete and 750 sq. yds. plaster required. No material purchased.

Tenders are being received till November 19 by the general contractor, W. G. Farley, 1291 Wellington St., for plumbing, electric, plastering and heating trades in connection with $5,000 residence to be built on Julian St., for Rose M. Farley, care general contractor. Balance of work by general contractor.

Regina, Sask.

Plans and specifications of 4 residences, $5,500 each, to be built corner Garnet and Montague Sts., for C. O. Hodjins, Royal Bank of Canada, Brantford, Ont., are in the hands of local agent, Mr. Tirick, 2336 Garnet St., Regina.

Stratford, Ont.

Wm. Newman, Cherry St., contemplates building 14 residences, total cost $42,000, and wants prices on all material. 1½ stories, 21 x 27, brick veneer construction.

Toronto, Ont.

The walls are going up for 2 residences, $8,000 each, corner Chaplin Crescent and Lascelles Blvd. J. E. Hoare, 16 Hilledale Ave W., is the owner and builder. Electric, plumbing and heating being done by regular staff. Tiling to be let. Plastering by day labor.

Excavating work has been done for 4 residences $4,000 each, south side St. Clements Ave., near Avenue Rd. Wm. J. White, 51 High Park Blvd., is the owner and builder and employs regular staff and buys material as required. Carpentry and masonry by day labor.

Painting, plastering, heating, electric and plumbing trades are to be let on $6,500 residence being built south side Park Rd., near Kennedy Ave. A. Conley, 105 Armadale Rd., is the owner and builder.

Excavation work is being done for $6,500 residence north side Bertram Ave., near Windermere Ave. D. Rynders, 410 Brock Ave., is the owner and builder. Tenders are being received on painting plumbing, heating, electric and plastering.

Walls are going up for $7,500 residence east side Durie Ave., near Ardagh. A. Tucker, 227 Fairview Ave., is the owner, and is receiving tenders on plastering, painting, plumbing, electric and heating trades.

The walls are up 1st joist for 2 residences, $6,500 each, west side Windermere Ave., near Ardagh. E. J. Moore, 176 St. Clarens Ave., is the owner and builder. Carpentry and masonry by day labor. Tenders are being received on painting, plumbing, heating, plastering and electric. Owner buys material.

Chris. E. Mountain, 174 Campbell Ave., is the owner and builder of 2 residences, $6,000 each, west side Gilbert Ave., near Innis Ave. No material purchased. Painting, plumbing, heating, electric and plastering to be let.

The walls are going up for $15,000 residence on Russell Hill Rd., near Frybrook Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Tenders are being received by the owners on all mechanical trades, also carpentry work (labor only). Masonry by day labor.

Excavation work is being done for $7,500 residence north side Glengrove Ave., near Heath St. Ed. C. Warren, 88 Glengrove Ave., is the owner and builder. Tenders are being received on painting, plumbing, heating, electric and plastering. Carpentry and masonry by day labor.

Frank Wright, 169 Glendennan Ave., is the owner and builder of $7,000 residence at 85 Spring St. Carpentry and masonry by day labor. Plumbing, heating, electric, plastering and painting trades to be let by the owner.

The footings are going in for 2 pair residences, $6,000 a pair, south east corner Snowden and Ronan Ave. W. E. Taylor, 22 Falcon St., is the owner and builder, and employs regular staff and buys material as required. Masonry day labor. Carpentry, owner and day labor.

Excavating work is being done for 1 pair residences, $8,000, at 65-7 Bowood Ave. Masonry day labor. Wm. Hodgkinson, 70 Bowood Ave., is the owner and builder and will let plumbing, heating, electric, plastering and painting trades. Carpentry by owner and day labor.

Thos. Taylor, 71 Vermont Ave., is the owner and builder of $9,500 residence and garage east side Humewood Ave., near High. Masonry day labor. Painting, plastering, heating, electric and plumbing to be let.

David Walton, 47 Simpson Ave., contemplates building 1 pair residences, $7,000, at 235-7 Greenwood Ave. 2 stories, shingle and brick construction.

Foundations are going in for $12,000 residence, north side Inglewood Drive, near McLellan Ave. Tenders are being received by the owner, J. S. A. Whealy, care architects, J. Hunt Stanford & Son, 67 Yonge Arcade, Toronto, on tiling, electric, plumbing, heating, plastering and tiling. C. A. Scott, 22 Stanhope Ave., is the general contractor.

G. Howe, 175 Cosburn Ave., is the owner of $7,500 duplex residence and garage being built on Hopedale Ave. Painting, plumbing, heating, electric and plastering trades to be let.

Excavation work is being done for $7,500 residence west side Wychwood Ave., near St. Clair West. C. Thorne, 545 Crawford St., is the owner and builder. Painting, plumbing, heating, electric and plastering to be let.

Ed. J. Hewitt, 653 Broadview Ave., is owner and builder of 2 residences, $8,000, on Brookdale Ave., near Yonge, and will let painting, plumbing, heating, electric, and plastering trades. Masonry by day labor.

Geo. A. Clark, 115 Glengrove Ave., is the owner and builder of $7,500 residence at 163 Alexander Blvd. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade, Toronto. Owner supervises work and will let the electric, plumbing, heating, plastering and painting trades.

J. M. Cowan, 991 Bay St., is preparing plans of 3 duplex residences to cost $15,000, on Parkside Drive for A. Marotta, 2233 Dundas W. Owner will let all contracts.

D. E. Munro, 65 Lawton Blvd., contemplates building about 30 residences $10,000 each, on Burnaby Blvd. and Oriole Rd. This work will probably start in the spring.

N. J. Liscombe, 55 Keystone Ave., is the owner and builder of 2 pair residences, $7,000 pair, corner Kingston Rd. and Orchard Park Blvd. Painting, plumbing, heating, electric and plastering to be let.

Verdun, Que.

O. Montpetit, 1362 Evelyn St., is the owner and builder of $9,000 residence on Verdun Ave. Masonry, roofing, electric, plumbing, plastering and painting trades to be let.

The foundations are going in for $18,000 residence on Third Ave., for G. H. Daoust, 61 Second Ave. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let.

Walkerville, Ont.

McDonald & Lawton, Victoria Ave., are the owners and general contractors of $7,000 residence and garage being built on Victoria Road. Heating, plumbing, electric, plastering and painting to be let. No material purchased.

Excavating work is being done for a two-family residence on Lincoln Road. Robt. Holloway is the owner and general contractor. Electric, plumbing, plastering and painting to be let.

Windsor, Ont.

H. St. Ouze, 1072 Wyandotte St., is the owner and general contractor of $6,500 residence on Hall Ave. Electric, plumbing, plastering and painting trades to be let. No materials purchased.

CONTRACTS AWARDED

Birchcliffe, Ont.

The following sub-trades have been let on 2 residences, $4,500 each, being built by A. Flatman, 180 King Edward Ave.: electric—Chas. H. Dowling, 59 Duvernet Ave.; plastering—E. Butler, 171 Westlake Ave.; heating—Toronto Furnace Co., 35 Golden Ave. Painting by day labor. Plumbing trade has been let.

Brantford, Ont.

J. Usher, 110 Arthur St., has the contract for plastering $5,000 residence being built on Colborne St. W., for J. E. Carson. Painting is being done by general contractor, Alex. Lamb, 101 Arthur St.

Chipman, Alta.

The foundations are going in for $10,000 residence for John Warschewsky. General contractor is Nick Nyckolowick, Smoky Lake, Alta.

Hamilton, Ont.

A. Bolingbroke, 7 Hughson St., is the general contractor for 3 residences $6,000, on Cluny Ave., for S. Washington, 7 Hughson S. Roofing, plumbing, heating, electric, plastering and painting trades to be let. No material purchased.

The following sub-trades have been let on 3 residences being built on Tuxedo Ave. by Witt, Bull & Oxford, owners and general contractors; electric—Wm. Thornton; plumbing—Wm. Newell; heating — Chas. Havers; plastering — Hancock Bros.; painting—Mr. Hood, Park & Roxborough.

The foundations are going in for 2 residences, $4,000 on Cluny Ave., owned by S. Washington, 7 Hughson S. Following sub-trades have been let; masonry—Kent & Lawson; plumbing—McMillan & Ford; heating — Mr. Williamson, Cluny Ave. A. Bolingbroke, 93 Ottawa S., is the general contractor.

Kitchener, Ont.

The following sub-trades have been let on $5,000 residence being built on Locust St., for H. Alles, 90 St. George St.: masonry—C. Dankwart; plumbing, heating—Battler & Freiburger; carpentry—H. Gatchene, Waterloo. Painting by day labor.

Reitzel Bros., Waterloo, Ont., have the general contract for $6,000 residence being built on Queen St. S. for C. J. Trapp, 181 Queen St. S. Painting, heating, electric and plumbing to be let.

Geo. Dippel, 19 Merner Ave., has the contract for painting on $10,000 residence being built on Park St. for W. Heberbrandt, Cherry and Park Sts. Electric by day labor.

Reitzel Bros. Waterloo, Ont., have the general contractor on $12,000 residence being built on Margaret Ave., for Geo. Bray, 21 Maynard Ave. Architects are Sharp & Horner, 73 King W., Toronto.

Montreal, Que.

The following sub-trades have been let on 2 residences, $15,000, being built on Cote St. Antoine, near Wilson; brickwork — J. Cassiana; millwork — Desjardins & Fils; roofing—J. E. Mayer; electric—O. Labelle; plumbing and heating —A. Blais; plastering—Laporte & Longpre; tiling—E. Lepage. J. P. Tremblay, 293 Prudhomme, is the owner and builder.

E. Leonard, 408 Garnier, is the owner and builder of 2 residences, $14,000, on Delanaudiere, near St. Joseph Blvd. Millwork—Pigeon & Draseaux, Montreal North. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

The following sub-trades have been let on 4 residences, $25,000, on Old Orchard, between Monkland and Terrebonne; roofing—Campbell Gilday Co., Ltd.; electric—J. S. Drummond; plastering—J. O. Nantel; painting and glazing —W. G. Borland. Masonry by day labor. S. W. Ogilvie, 23 Grey Ave., is the owner and builder

L. A. Ott & Co., 10 Cathcart St., are the general contractors for 2 residences costing $20,000 on Mira Ave. and Circle Rd., for J. K. L. Ross, 107 St. James St. Masonry, marble, millwork, roofing, electric, plumbing, heating, plastering and painting to be let.

The following sub-trades have been let on 2 residences, $15,000, on Vendome near Cote St. Antoine; brickwork—J. Cassiana; millwork — Desjardins & Fils; roofing—J. E. Mayer; electric — O. Labelle; plumbing and heating—A. Blais; plastering—Laporte & Longpre; tiling—E. Lepage. J. P. Tremblay, 293 Prudhomme, is the owner and builder.

L. A. Ott & Co., are the general contractors for 3 residences, $30,000, on Glencairn Ave., Notre Dame de Grace, for Estate David Williamson, care general contractors. Masonry, marble, roofing, electric, plumbing, plastering, painting and tiling trades to be let.

L. A. Ott & Co., 10 Cathcart St., have the general contract on $12,000 resion Mire Ave., for Sir Herbert Holt, 83 Craig St. West. Masonry, marble, millwork, roofing, electric, plumbing, heating, plastering, painting and tiling trades to be let.

L. A. Ott & Co. Ltd., are the general contractors for $10,000 residence to be built on Victoria Ave., for J. K. L. Ross, 107 St. James St.

A. Pilon, 1629 Park Ave., has the general contract for $7,000 residence near 3453 Greenshields. Carpentry by day labor. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let. Owner buys material.

Ottawa, Ont.

The walls are going up for $9,000 residence on Clemow Ave., for J. R. Hosie, care general contractors, Geo. A. Eaman Co., Ltd. Electric—Art Davis, Bronson Ave.; heating and plumbing—Bank & Cole. Painting and plastering by day labor.

The following sub-trades have been let on $5,500 residence on Ossington Ave.; electric—Wallace Chugg; heating and plumbing—Bank & Cole; plastering—Wowman Bros. Painting by day labor. W. K. Eastman, 23 Pansy Ave., is the owner and general contractor.

The following sub-trades have been let on $7,000 residence being built on Somerset St.; electric—G. Young; plumbing —Gervin & Holgins; heating—Pease Foundry Co.; plastering—C. Hunt. Painting by day labor. A. W. Davidson, 254 Cooper St., is the owner and general contractor.

The following sub-trades have been let on $6,000 residence being built on Ossington Ave.; electric—E. Headley; plumbing—Gervin & Hodgins; heating—Capital Hardware Co.; plastering—Patterson Bros. Painting by day labor. Fryer & Pout, 21 Euclid Ave., are the owners and general contractors.

The following sub-trades have been let on $6,500 residence on Sunset Blvd., for Jas. Patterson, 276 Pretoria Ave.; electric—H. L. Allen; plumbing and heating—W. Allen; plastering—Murphy & Morrow. Painting by day labor.

The walls are going up for $7,000 double residence on Warren Ave., for A. A. Fayder, care general contractor, W. R. Jennings, 16 Spruce St. The following sub-trades have been let; H. L. Allen—electric; W. Allen, 15 Euclid Ave.,—plumbing; Capital Hardware Co. —heating — T. Squirrell — plastering. Painting by day labor.

Point Grey, B. C.

Smellie & Gallagher, North Vancouver, have the general contract for $5,000 residence on Devonshire St., for David Sutherland, 117—14th Ave. W., Point Grey. No materials purchased. No subtrades let.

Port Colborne, Ont.

The walls are going up for $3,500 residence on Catharine St., for Otto Wegerich. John Cook is the general contractor. Masonry, Peter Beam. Plastering, painting, heating, plumbing and electric to be let.

Sandwich, Ont.

J. Seiber, London St., has the contract for heating and plumbing of $5,000 residence on Alexander St. T. H. Startup, 141 Curry Ave., is the owner and builder. Plastering and electric to be let.

Saskatoon, Sask.

Miners & Ball, 614 Ninth St., have the general contract for $4,500 residence on Fourth Ave. N., for W. C. Perry, 1006 Lorne Ave.

St. Catharines, Ont.

J. Beatty, 10 Facer St., has the contract for electrical work on 3 residences being built by Allan Gogo, 9 Facer St., the owner and general contractor.

Three Rivers, Que.

C. E. Hamelin, 90 St. Prosper St., has the contract for plumbing and heating of $8,000 cottage being built on Notre Dame St., for B. J. Trepanier, 36 Belleau St.

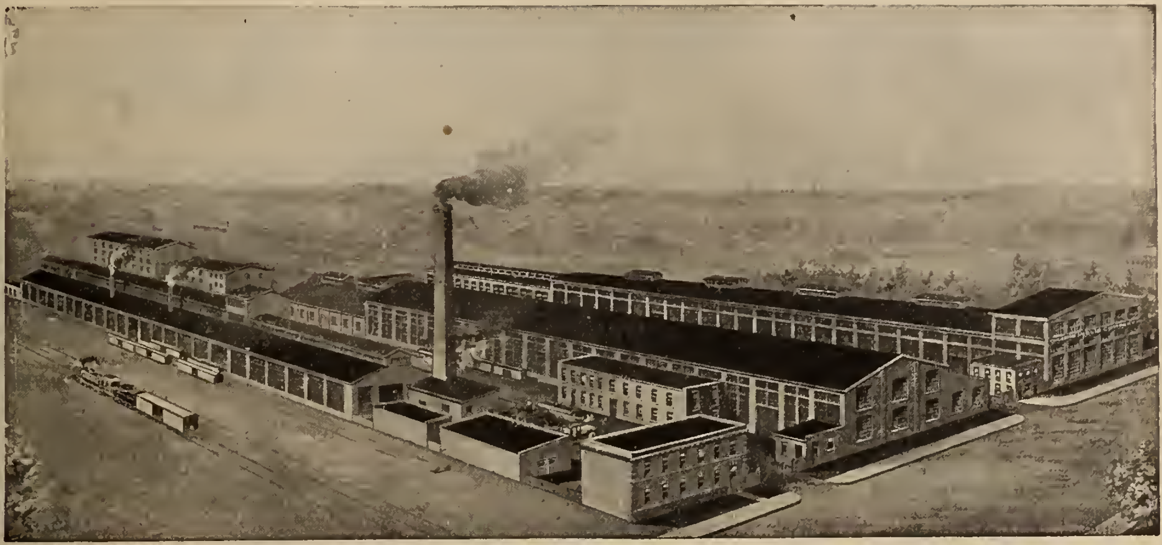
R. Gonneville, 17 St. Dennis St., has the contract for plastering, and Germain & Freres the contract for heating, in connection with $10,000 tenements being built on St. Francois Vavier St., for H. R. Winkenden, owner and builder.

The walls are going up for $12,000 bungalow on Notre Dame St., for Robert F. Grant. Contract for roofing, plumbing and heating has been let to C. E. Hamelin, 90 St. Prosper street. Architects, Asselin & Denoncourt.

Toronto, Ont.

W. East, King Edward Ave., has the general contract for 3 residences, $3,000 each, south side Westbrook near Meagher Ave., for Eastern Wrecking & Construction Co. Painting, plumbing, heating, electric and plastering to be let.

Dawson & Chipchase, 114 Davenport Rd., have the contract for masonry work on 1 pair residences, $6,500, south side Davisville, Ave., near Yonge. Ive & Loader, 112 Galt Ave., are the owners and builders. Painting, plastering, heat-



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G. A. Chisholm, 44 Lakeside Ave., has the contract for plumbing, and B. J. Iller Co., 550 Bathurst St., the heating contract, for 5 residences and garages, $12,000 each, at 31-33 Austin Terrace. A. Clark & Son, 224 Augusta Ave., are the owners and builders. Tenders are being received on electric, plastering and painting.

Excavating work is to start for $21,000 duplex residence on Northcliffe Blvd. Harry J. Long, 76 Glendonwynne, Ave., is the owner and builder. Electric — P. J. Dunn; plumbing — H. Ruddick; heating—J. G. Jackson.

D. J. Ratcliffe, 18 Richard Ave., is the builder of 1 pair residences costing $12,000, at 826-8 Gerrard E., for Dr. M. D. McKichen, 686 Broadview Ave. Owner buys all material, and will let the painting, plumbing, heating, electric and plastering trades.

The following sub-trades have been let on $10,000 duplex residence being built on Snowden Ave., for Harry J. Long, 76 Glendonwynne Ave.: electric —P. J. Dunn, 3124 Dundas W.; plumbing—H. Ruddick, 54 Appleton; heating —J. G. Jackson, 311 Kennedy Ave.

The following sub-trades have been let on $12,000 residence being built north side Regal Rd., near Northcliffe; electric—P. J. Dunn, 3124 Dundas W.; plumbing — H. Ruddick, 54 Appleton Ave.; heating — J. G. Jackson, 311 Kennedy; plastering by day labor. Painting by owner, Harry J. Long, 76 Glendonwynne Ave.

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THIRTY-SIX TORONTO STREET

The walls are going up for six residences, $3,000 each, west side Jane St., near Bexley Cres. M. J. Renwick, Bexley and Jane Sts., Mt. Dennis, is the owner and builder. Following sub-trades have been let: electric—J. C. Johnson, 1804 Danforth; plumbing—C. Gray & Son, 217 Sackville; plastering—Hope & Tapper, 111 Coxwell. Painting and heating to be let.

Geo. Coppertwaite, 118 Langford Ave., has the contract for heating and plumbing for 2 residences, $10,000 each, at 74-76 Dawlish Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders. Tenders are being received on painting, plastering, sodding, grading, drains and concrete work.

E. Corner, 698 Manning Ave., has the contract for excavation work for $12,000 store and apartment north west corner Yonge St., and Deloraine Ave., for A. Comella, 748 St. Clair West. No other trades let. Architect, Benj. Swartz, 336 Dundas W.

Waterloo, Ont.

H. Klem, 83 King St. E., has the contract for heating and plumbing for $6,000 residence being built on Simeon street for J. Hessenauer, Queen S. Reitzel Bros., Allen street, are the builders.

Westmount, Que.

The following sub-trades have been let on $300,000 apartment house south east corner St. Catherine and Lewis Sts.; marble, tiling and slate stairs—Hamon & Hess; electric—A. L. Allard; painting and glazing—Wm. Noseworthy & Sons; ornamental iron—Faustin Ltd.

Power Plants, Electricity and Telephones

St. Narcisse, Que.

Plans are being prepared for $250,000 hydro-electric power house and mills on River Batiscan, to develop 5,000 horsepower, for the North Shore Power Co., Baptiste Power Bldg., Three Rivers. J. C. Smith, Montreal, Que., is the engineer in charge. Old water power plant and dam is being wrecked and will rebuild on same site.

CONTRACTS AWARDED

Bryson, Que.

Ottawa River Power Co., Ltd., Montreal, Que., have awarded the general contract for dam and power house at Calumet Island Falls on the Ottawa River, to Fraser, Brace Ltd., 83 Craig St. W., Montreal, at $2,000,000. Engineers are Wm. Kennedy & Sons, Ltd., Montreal, and Dr. L. A. Herdt, owner's staff. Engineer Wm. Kennedy Jr., will buy hydro machinery, and engineer Dr. L. A. Herdt will buy electrical machinery.

Peterborough, Ont.

Plumbing and painting trades are to be let on $50,000 electrical distribution station corner Aylmer and Sherbrooke streets, for the local Hydro Electric Commission. V. C. Hayes, 219 Park St., has the general contract.

Port Hope, Ont.

M. Millwood has the contract for plumbing for $16,000 telephone exchange being built here. Electric to be let. Garnett & Sons, Port Hope, are the general contractors.

Miscellaneous

CONTRACTS AWARDED

Digby, N. S.

St. John Dry Dock & Shipping Co., Ltd., East St. John, N.B., have been awarded the contract for dredging at $13,000.

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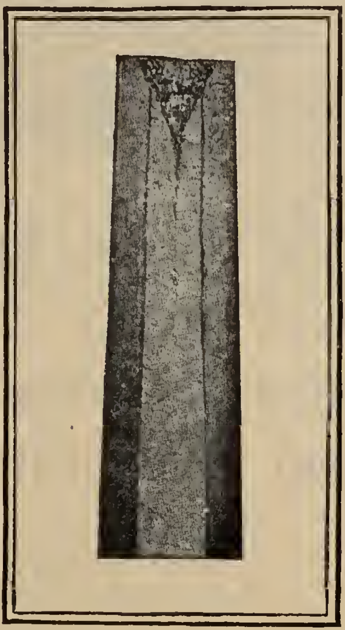

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The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation,, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity. and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in exactly the same condition as it was prior to its years of service.

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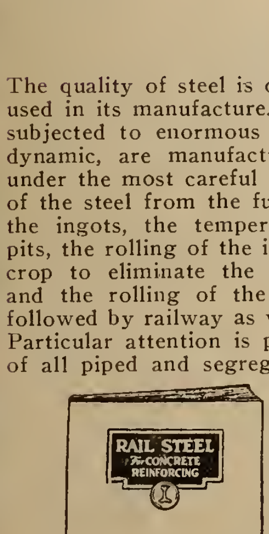

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Suggestions for Ditch Blasters

Some helpful hints for blasting ditches with dynamite are given in a recent issue of The Du Pont Magazine, from which we quote the following:

Creditable work calls for careful preparation. Particularly is this true of ditch-blasting by the propagation method. If you would blast a straight, trim, clean-cut ditch, make sure the ditch line is straight at the outset, space the holes uniformly, punch them to an approximately uniform depth, grade considered, and load accordingly. Unless there is a variation in the character or moisture content of the soil, unless rocks, stumps or other obstructions are encountered which necessitate special preparation, uniform loading can usually be relied upon to give uniform results.

A stout cord—stretched taut between wooden stakes along the ditch line and parallel to grade—is a dependable guide for keeping the holes in alignment. And one of the best ways to have the holes spaced regularly is to crimp double-pointed copper rivets to the cord at required intervals, so that when the cord is in position each rivet will show where a hole is to be punched.

Of course, if the ditch line is comparatively short the practice of fastening the rivets on the cord is hardly warranted; but if it is proposed to blast a ditch several hundred yards long, the time required to prepare the cord in this manner is usually well invested. For ditches of short length, many professional blasters merely use a stick of wood cut to the desired length for regulating the space between holes.

Wooden punch-bars, gradually tapering to a point, and of a diameter large enough to admit a 1¼ in. cartridge, have been found most satisfactory for making holes in soft ground. In hard ground steel bars are necessary.

After the holes are punched it is important that the dynamite charges be forced down into the ground an even distance from the cord. This is easily done by the simple expedient of cutting a notch on the tamping stick as a guide in pushing the charge in place.

It is good practice to pour a little water in the holes, if no water is encountered, in order to punch them more easily. After loading, it is a good plan to fill the holes with water to act as tamping and also to assist propagation.

Steel Tank Safety Refuge in Blasting

Men engaged in blasting at quarries need some safety refuge that can be readily moved from place to place as the work progresses. Without such a protection the men spend too much time in getting off to a safe distance and then coming back to work. According to Successful Methods the Louisville Cement Co., of Louisville, Ky., has happily solved the problem, and is speeding up production, by the simple expedient of providing cylindrical steel tanks. These tanks were formerly coolers in the cement mill proper. They were converted into places of safety by merely closing up one end with heavy timbers and bolting 2 x 4 in. timbers extending a full length on either side for the men to brace themselves against. These tanks can easily be rolled from place to place and can be stationed fairly close to the blast.

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M	28.50	25.00	32.00	
Enamelled brick	per M	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M			8-12c. per ft.	105-240.00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¼	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.50 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50—6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS:—.Discount on flue linings is 55%

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.

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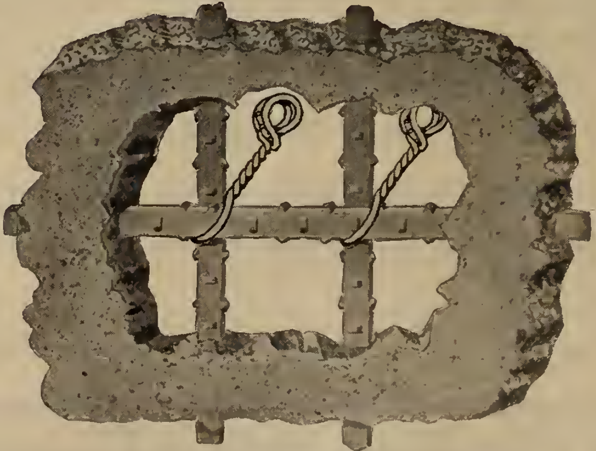

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A little in front o' the next."

They copied all they could follow,
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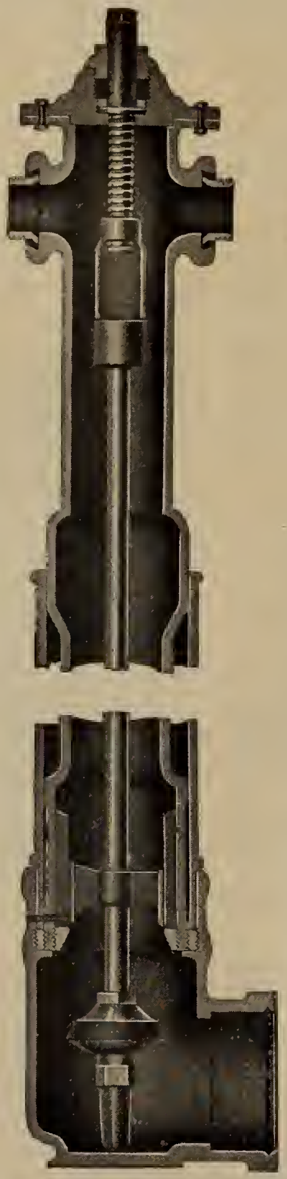

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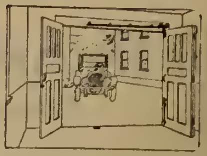

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It gave us no trade discount.

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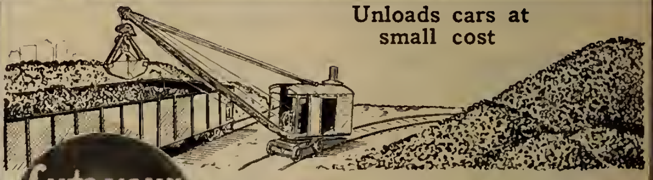

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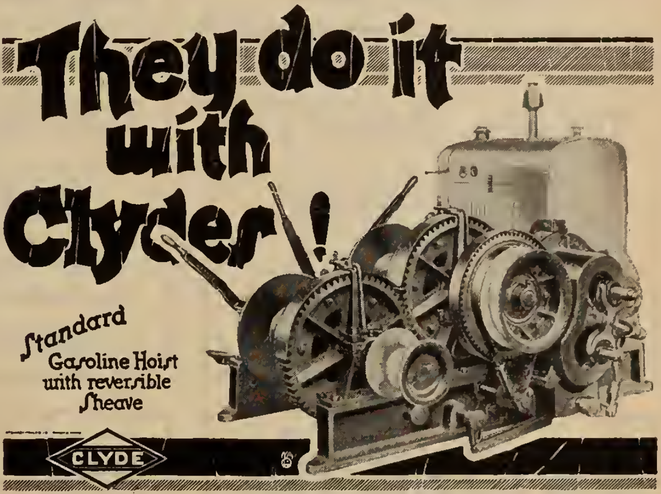
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CLYDE

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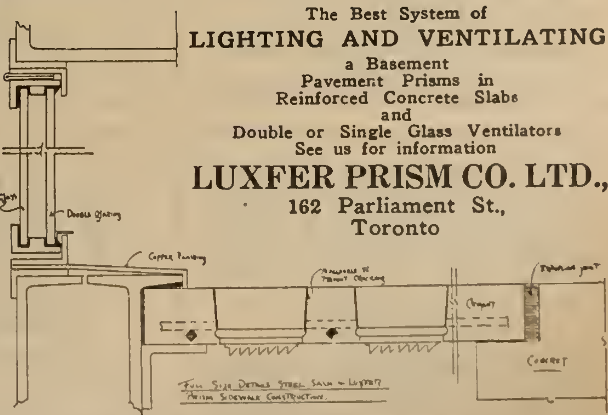
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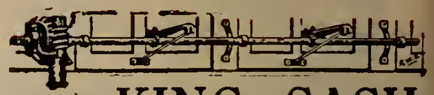

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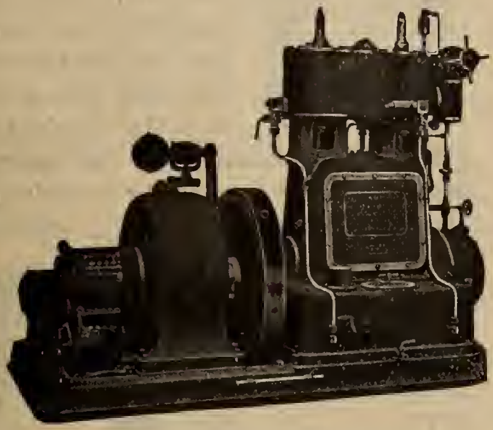

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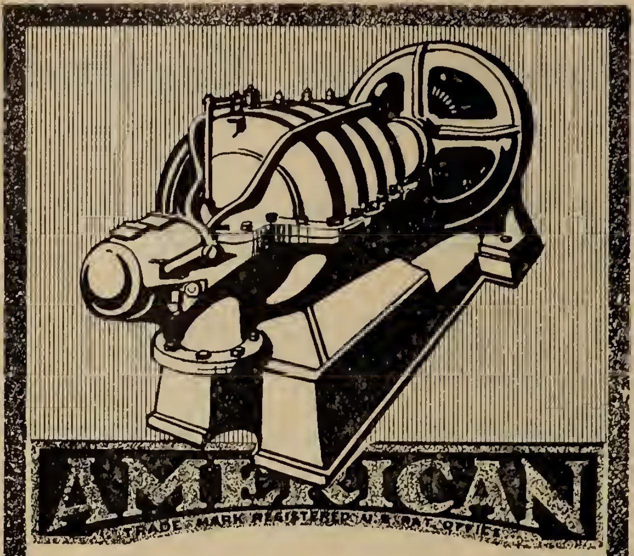
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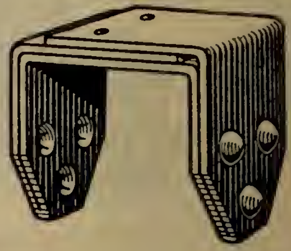

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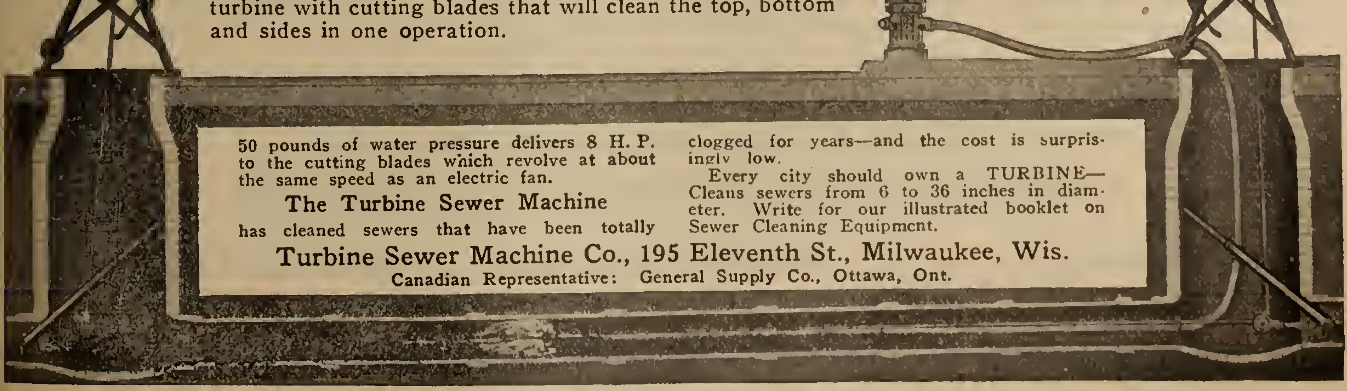

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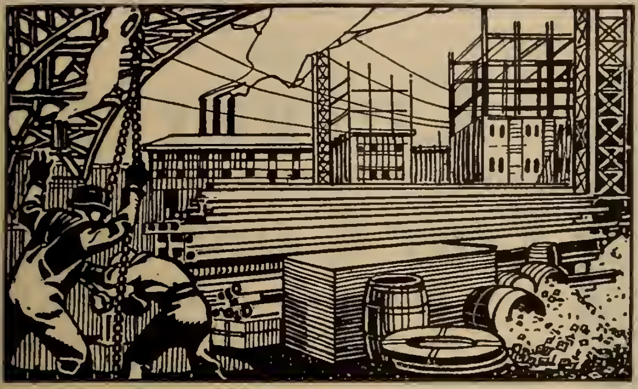

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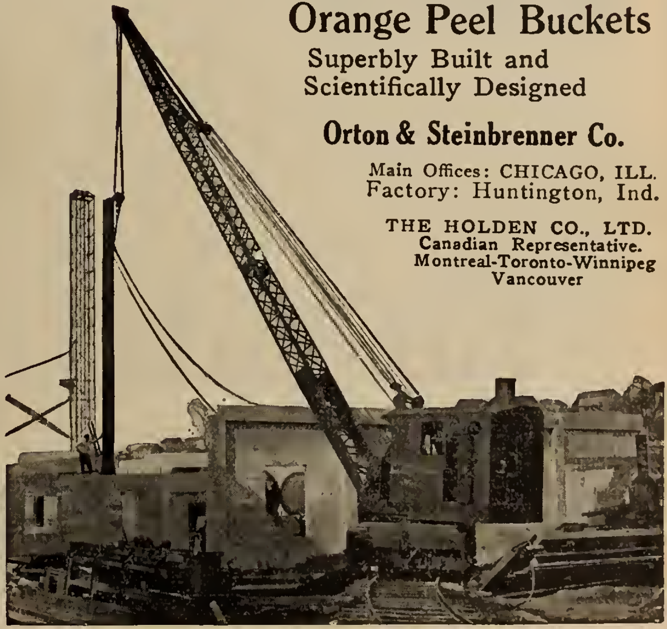

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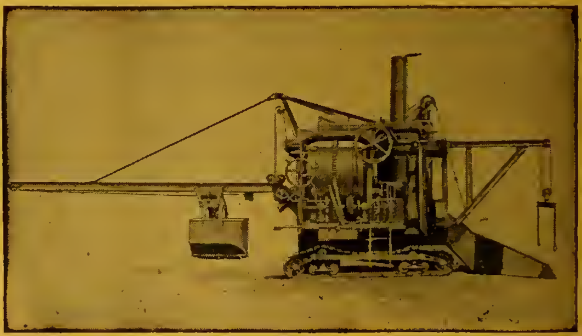

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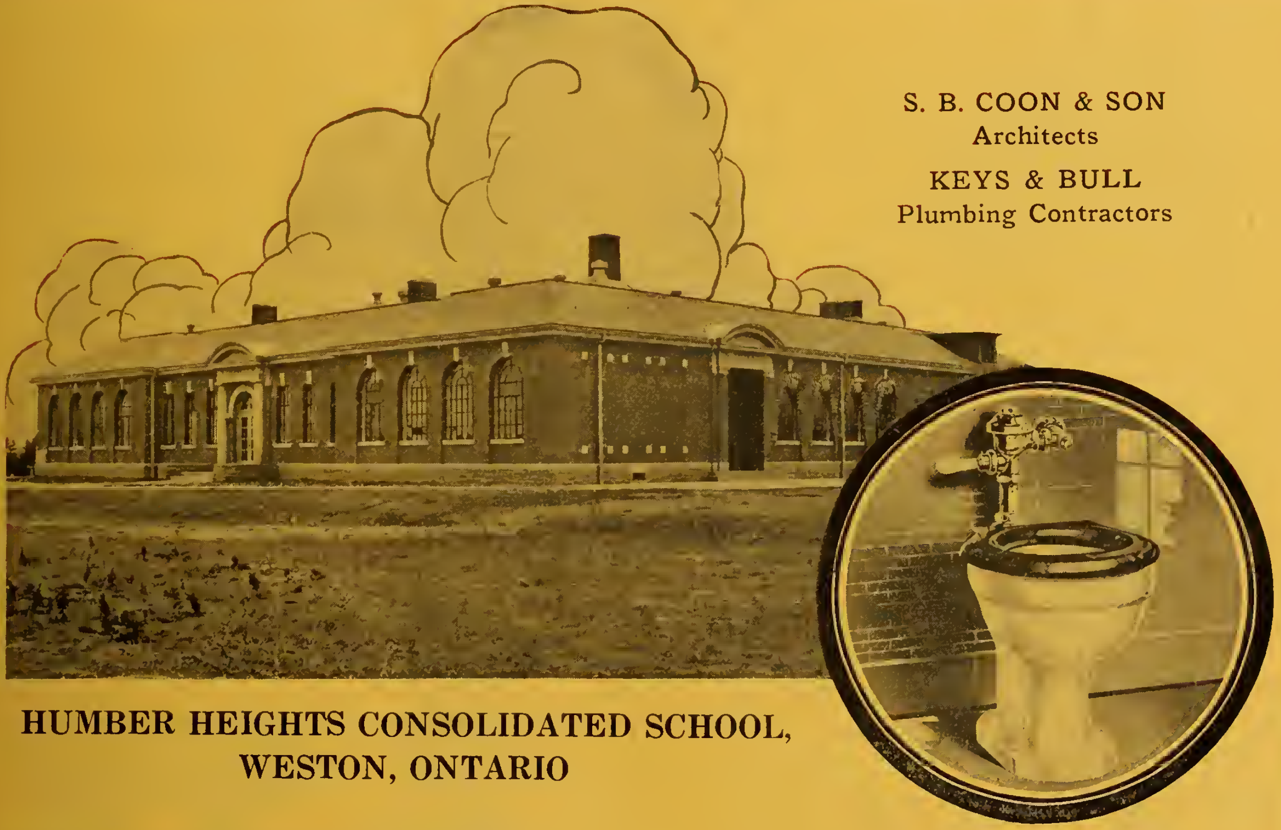

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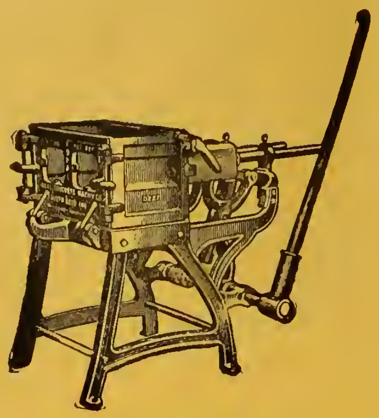

Fig. 910

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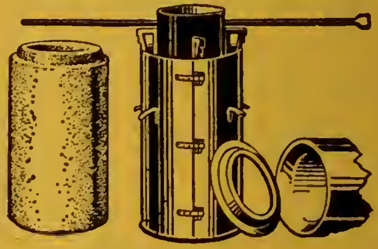

Fig. 95.

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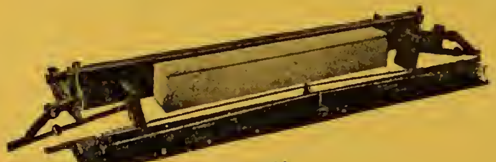

Fig. 430

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No. 3. No. 3A. Colonial Lawn Vase

—Described in Bulletin O-R

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7, London, Canada

World's Largest Manufacturers of Concrete Machinery

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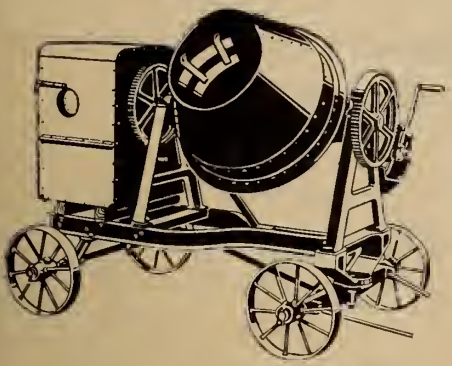
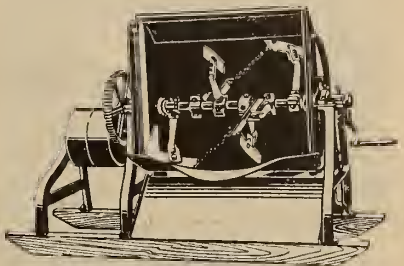


London Mixer, made in two sizes

entrusted with large contracts specify "LONDON MACHINES" not on account of the price, but because they will run continuously under the most exacting conditions.



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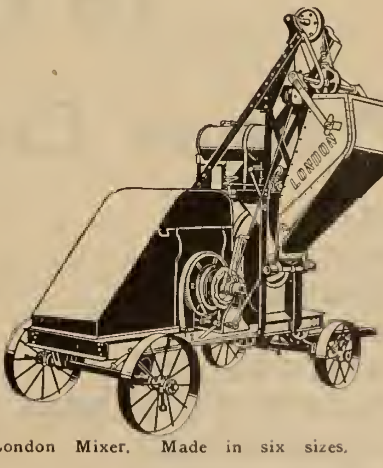

London Mixer. Made in six sizes.

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We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

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World's Largest Manufacturers of Concrete Machinery

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(Continued on page 8)

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The Ritchie Cut Stone Co. Ltd.

Hamilton, Ont.

will be in a position to handle contracts of any size and make quick, prompt shipments after

December 15, 1923

This view of our mill in Hamilton was taken to give you an idea of the extra large stock of stone which we carry at all times.

Superior workmanship and better service are the aims of our entire organization.

THE RITCHIE CUT STONE CO. LTD., HAMILTON, ONT.

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Capacity!

CAPACITY, the profit factor is measured, not alone by bucket dimensions, by line-speed and power, but is greatly increased or decreased by flexibility of operation, speed and ease of control, and ability to stand up to unsparing high speed operation without breakdown delays, or fast depreciation.

Boom with load. The Koehring alone is designed to combine the functions of elevating, or lowering boom, and of swinging boom simultaneously. No excessive wear. This new flexibility means excess capacity. *Single lever* steering turns crane to right or left, propels it forward or backward. Easy to control as a motor truck. Koehring heavy duty construction, the assurance of trouble-free, long service life — another big factor of extra capacity.

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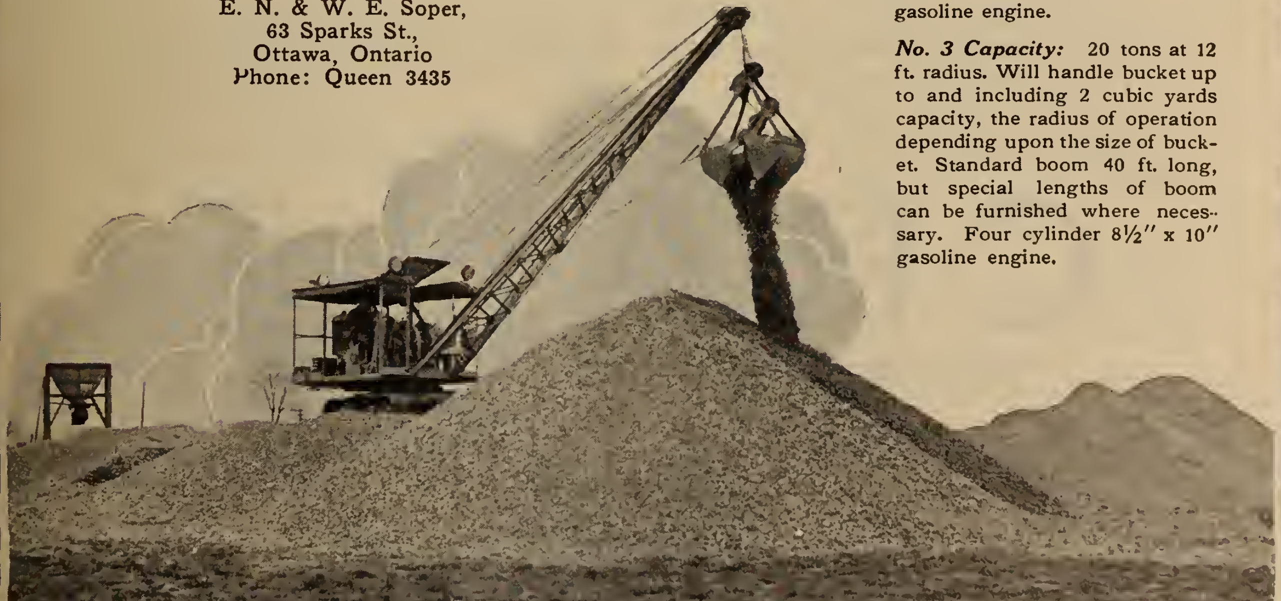
HEAVY DUTY

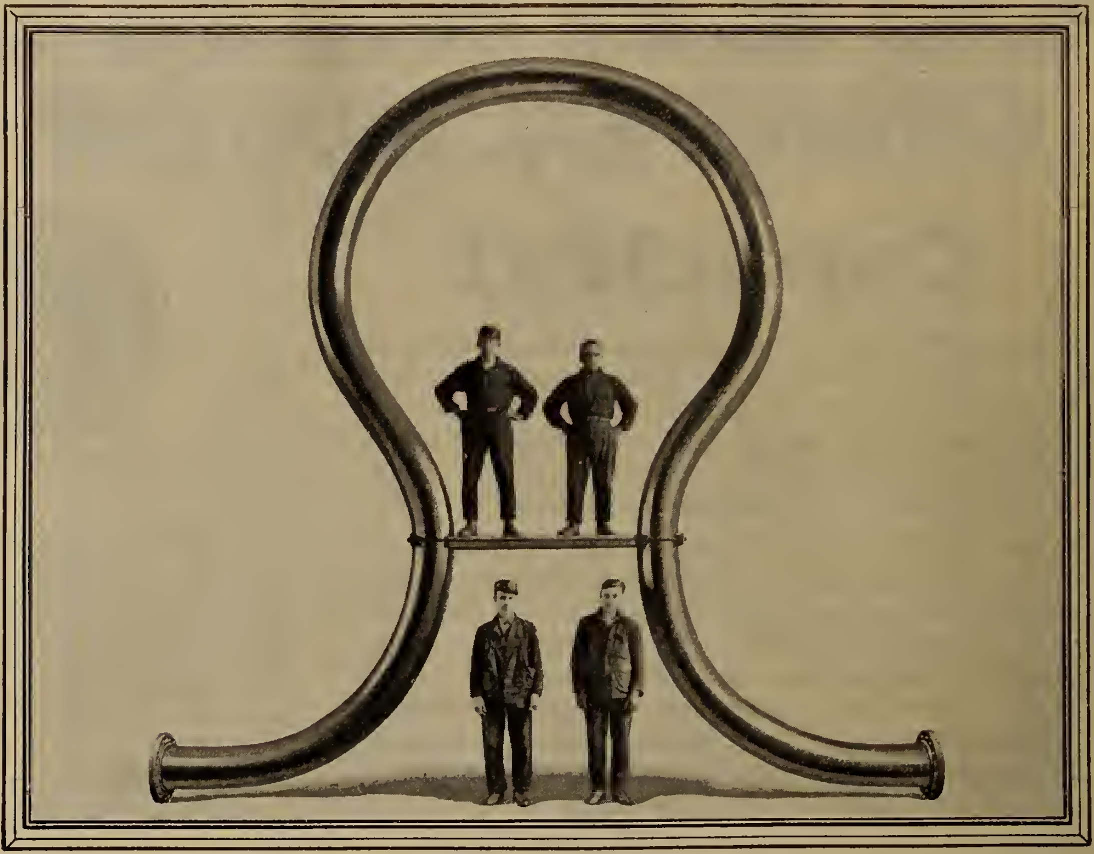
REG. U. S. PAT. OFF.

No. 1 Capacity: 7 tons at 12 ft. radius. Will handle bucket up to and including one cubic yard capacity, the radius of operation depending upon the size of the bucket. Standard boom 35 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 5″ x 6″ gasoline engine.

No. 2 Capacity: 12 tons at 12 ft. radius. Will handle bucket up to and including 1½ cubic yards capacity, the radius of operation depending upon the size of the bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 7½″ x 9″ gasoline engine.

No. 3 Capacity: 20 tons at 12 ft. radius. Will handle bucket up to and including 2 cubic yards capacity, the radius of operation depending upon the size of bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 8½″ x 10″ gasoline engine.





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Crane standard proportions and regular Crane methods of construction, followed in the making of this huge 12-inch expansion bend, satisfied every requirement of the engineers of the Ford works at Toronto, where it will be used. The Crane plants are equipped to make bends of any size of pipe in any required shape. Crane's broad experience in planning piping equipment is always at your command to help you solve your particular problems.

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"Luxton" Drinking Fountain

MUSSENS M LIMITED

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2. *Showing how the Barber-Greene, in extremely cold weather that would discourage many shovel men, handles snow that is almost entirely ice.*
3. *Showing the Barber-Greene handling large lumps.*
4. *Truck loaded by a Barber-Greene—higher than shovelers could throw.*
5. *In Albany a Barber-Greene loaded 45 trucks an hour last winter.*

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Just as much snow falls now as in years past, but the drifts that seemed deep to us as children don't look so big to us now that we are grown.

Not only is there as much snow now as there was 30 years ago, but there seems to be just as much as there was 100 years ago. Philadelphia has kept weather records for 250 years. These records show an average yearly snow fall of 22.2 inches.

For the last ten years the Philadelphia average has been 25.9 inches.

It is certain from the Philadelphia records and from the Weather Bureau's figures for the entire country, that our winters now bring as heavy snows as the country has known.

Because of the greater dependence on transportation of all kinds, the snow must be removed much more rapidly than formerly in order to avoid heavy losses to business and industry.

Many cities are speeding up snow removal and cutting its cost by using Barber-Greene Snow Loaders.

Chicago was the first to use one and found that it saved $450 per eight hour shift in 1920. The Boston Elevated Railway estimates that theirs does the work of 150 men.

Schenectady, Philadelphia, Albany, Pittsburgh and Springfield, Mass., are among the many other cities in which Barber-Greenes are used.

Send for "Mechanical Snow Handling," which describes the Barber-Greene and the new side discharge design.

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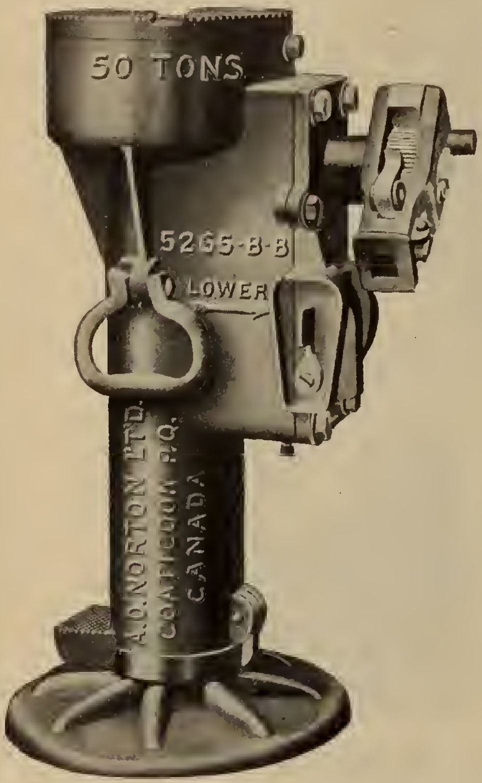

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HIGH SPEED - SELF LOWERING

You don't need to pump the load down
Just press the lever

Bridge Jacks, Track Jacks,
Journal Jacks, etc.

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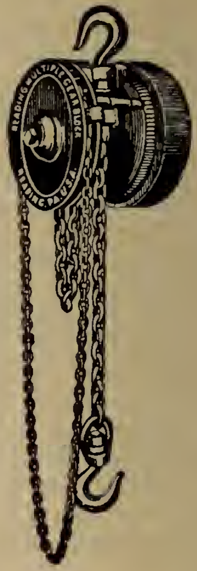
MULTIPLE-GEAR

CHAIN HOISTS

Guaranteed for Life

Also
Reading Electric Hoists



MUSSENS LIMITED

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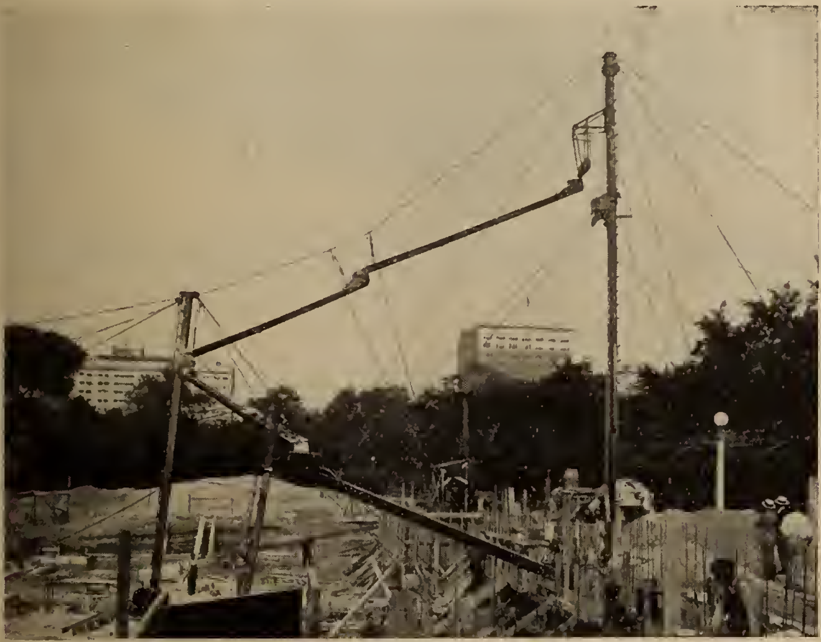
You can have a distributing plant for your concrete, which is flexible, easily set up and taken down—Takes very little room and is a handy piece of equipment.



The
INSLEY MAST HOIST
BUCKET PLANT

Made in two sizes with 8 ft. and 14 ft. buckets

You can build your own wood mast or we can furnish you an Insley Steel Mast.

INSLEY Concrete Distributing Plants, Towers, Chutes, Buckets, Hoppers, Booms, etc.

We specialize in Excavating and Material Handling Equipment

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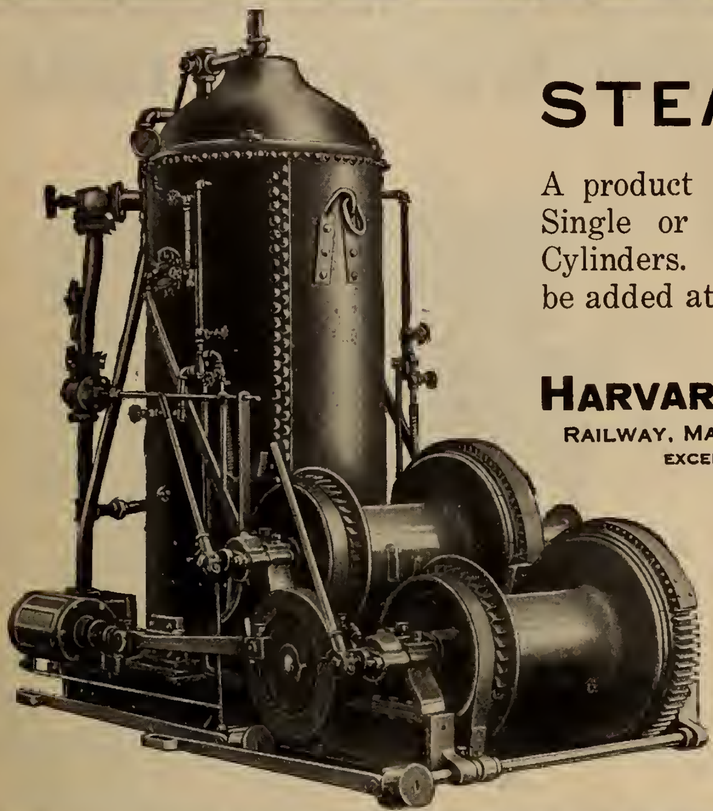

STEAM HOISTS

A product of the Mead-Morrison shops. Single or Double Drum with Double Cylinders. A third drum or swinger can be added at any time. Made in Canada.

HARVARD TURNBULL & CO.
RAILWAY, MARINE AND CONTRACTORS SUPPLIES
EXCELSIOR LIFE BLDG., TORONTO ST.
TORONTO

Figs. 345 and 400 "F. M."

This Jenkins Indicator Post is approved by the Fire Underwriters

Jenkins Indicator Posts are made with the same precision and care as Jenkins Valves and are just as reliable in every respect.

The satisfactory service they furnish is typically Jenkins. Their design, the materials used in their construction and the way they are constructed guarantee that.

These Posts and the complete line of Jenkins Diamond-marked valves are described fully in Catalog No. 9. Write for free copy.

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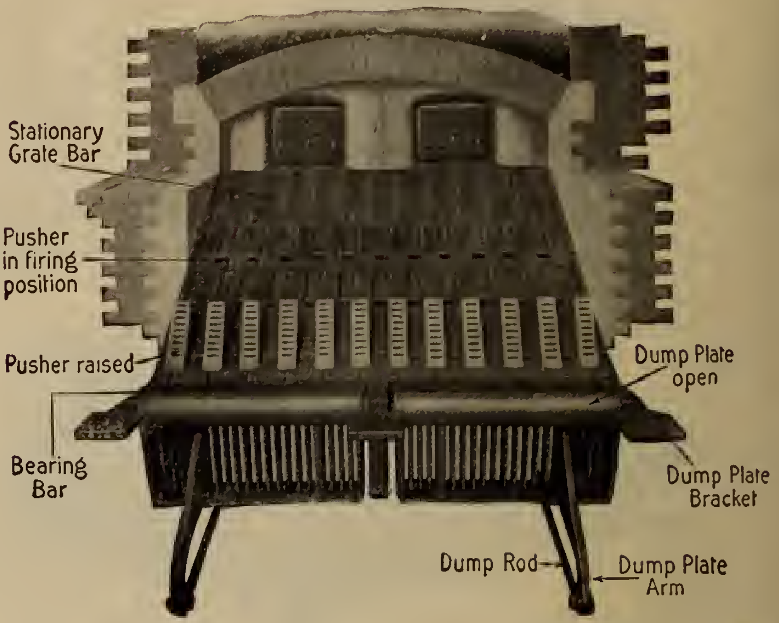
Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

How to get complete and smokeless combustion with low grade fuels

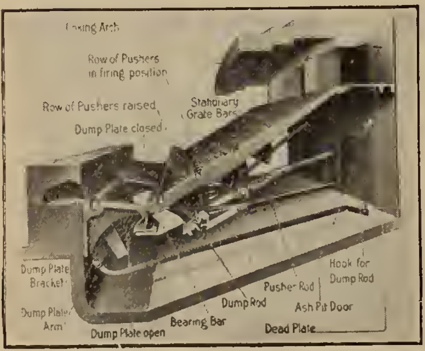
The National Stoker insures a clean stack with the lowest grades of coal, a stack that will comply with any city smoke ordinance without the use of steam jets or other devices

The National Hand Fired Stoker consists of a system of downward sloping grate bars, fuel pushers, dump plates, boiler front, bridge wall and ignition arch. In firing, all that it is necessary to do is to dump the fuel on the upper end of the grate and when this is coked it is moved a stage further down by means of pusher rods operated from the front of the furnace, and a fresh charge of fuel may be dumped in. No need to spread the fuel—any "green" hand can thus do the firing. The successive pusher rods keep the fuel marching downward, ensuring perfect and smokeless combustion, until the lowest or dump grates are reached. The draft is evenly distributed throughout the fire bed and excellent results can be secured with waste and low grade fuels. You get all the advantage on a small scale, and without the great cost of the large mechanical Stokers.



View of National Hand Fired Stoker looking from the back of the fire box towards the fire doors which are closed

NATIONAL HAND FIRED STOKER



Side view showing downward sloping banks of grates operated by pusher rods from the front of the furnace

The National Stoker voids the ash without raising it into the hot zone of the fire bed, and therefore without producing clinker. This is the reason why it has proved eminently successful in handling high ash, free burning western coals. With eastern caking coals, the pushers break up the cake so air can get through, thereby making possible a high rate of driving with only moderate draft. The National Stoker keeps the fire bed clean at all times.

In one National installation, an actual saving of 800 tons of coal was obtained in six months' heating season, during which the average outdoor temperature was 8°F. lower than that of the preceding winter. The economy and efficiency realized were so high that the plant was operated on only three boilers. Previously four boilers had been required.

The National Hand Fired Stoker can show large fuel and labor savings in plants up to 500 h.p. Can be installed in your present plant—do not wait until you need a new boiler. Booklet and full particulars gladly sent on request.

Engineering & Machine Works of Canada, Ltd.

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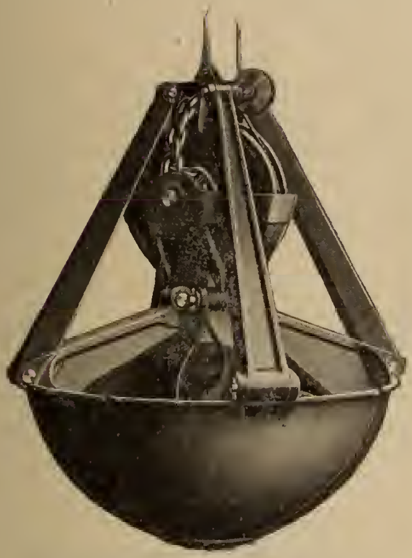
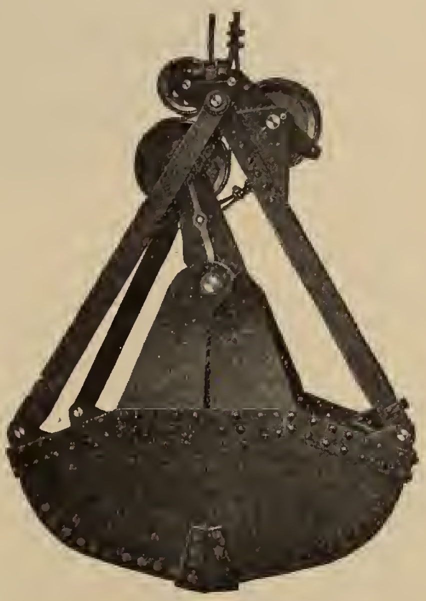
CANADIAN MM Co MEAD-MORRISON CANADIAN MM Co

GRAB BUCKETS



Orange Peel Grab



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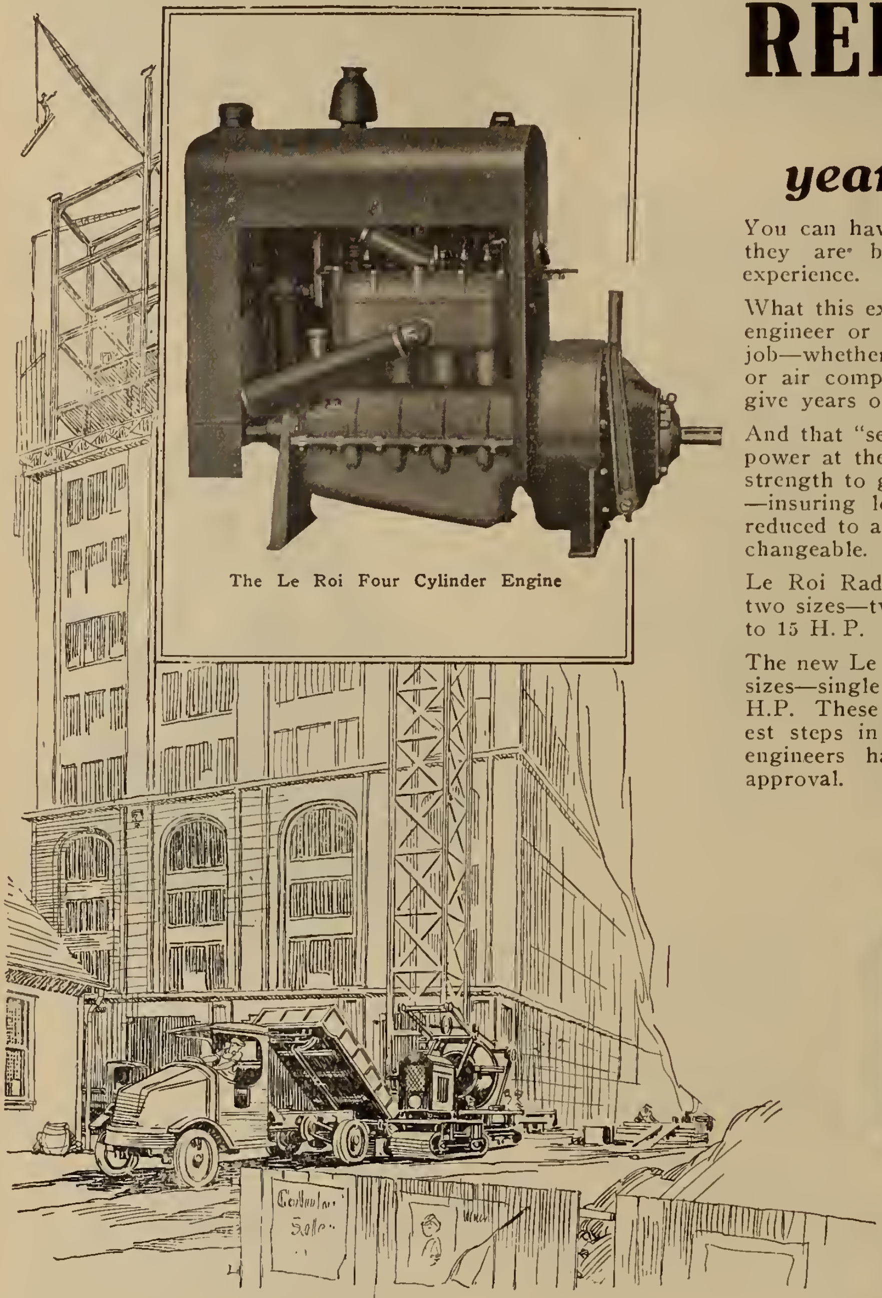

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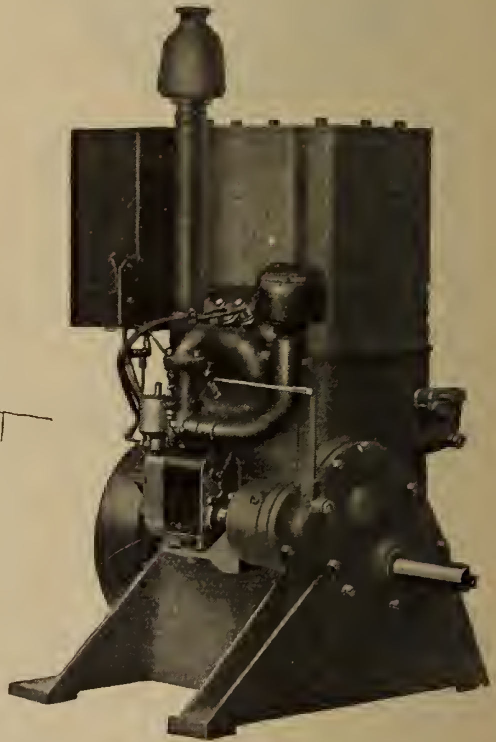

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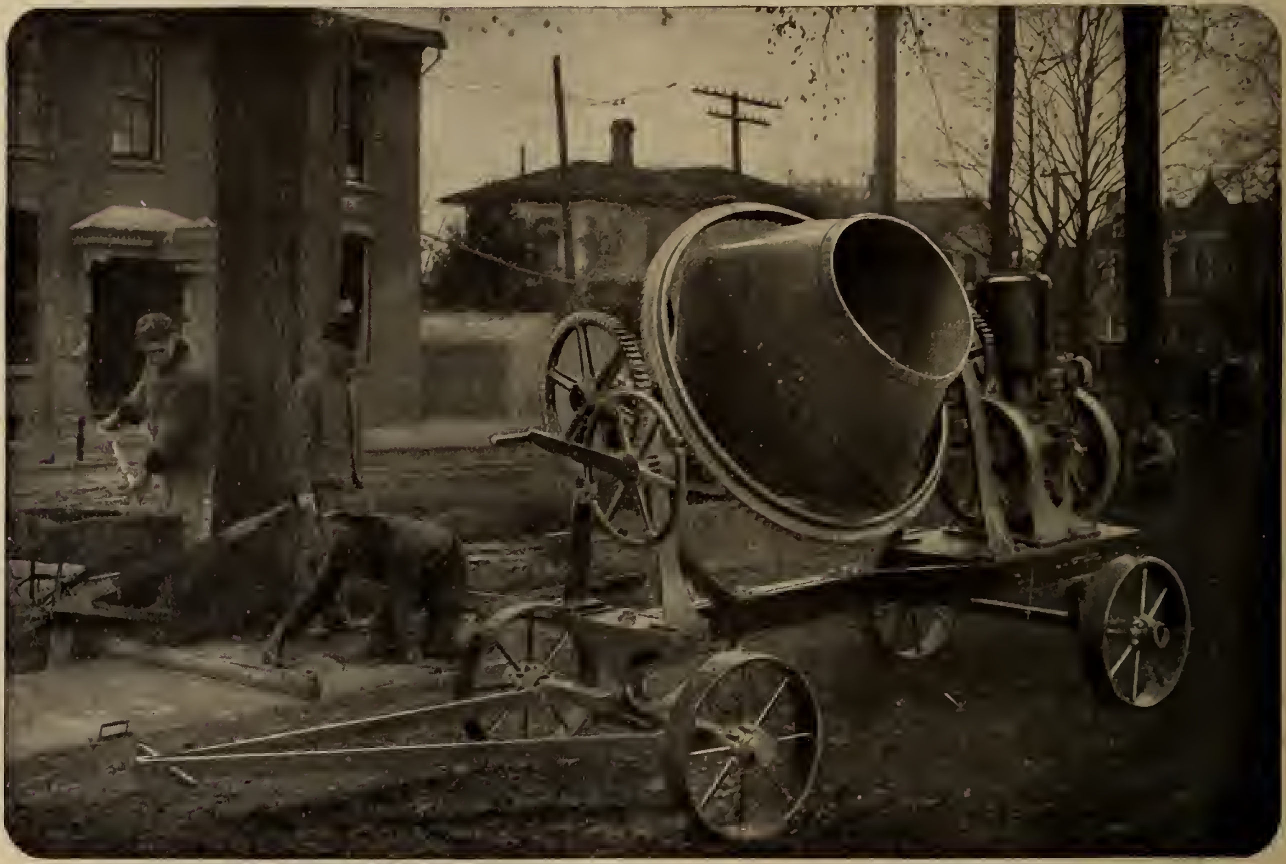

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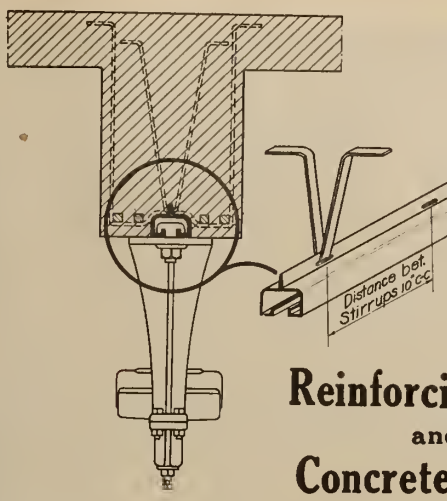

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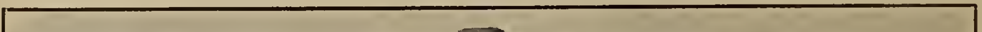

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Devoted to Construction and Engineering

Vol. 37 Toronto, November 21, 1923 No. 47

The St. Lawrence Waterway Development—Should National Rights be Sacrificed?

Other Proposals Might be More Justifiable — Dam at Rapide du Plat is Suggested as a Scheme That Would Meet Requirements

By E. A. Forward, M. E. I. C.

Owing to the attempted encroachments by private companies on the St. Lawrence water powers on the international section of the river, the Canadian government, several years ago, suggested to the United States federal government that steps should be taken to devise some general plan under which development of power on the international section of the St. Lawrence should proceed consistently with the preservation of rights of navigation. The order-in-council re this proposal read:—

"Even though the utilization of only a portion of the whole capacity of the river can be immediately contemplated, yet the endeavour should be to design at the outset a complete scheme into which successive developments might be fitted from time to time, as and when the occasion might demand. Without some such scheme there is always the great danger that the ultimate possibilities of the St. Lawrence navigation may be neglected or even irreparably injured."

No negotiations between the two governments resulted. There has been, however, continued activity of private interests in the United States to secure the use of the water powers in this section. Following demoralization of the American railways during the reconstruction period after the war, the power scheme for the St. Lawrence reappeared coupled with an urgent demand from the middle west states for a gigantic combined deep waterway and power development on the St. Lawrence from the Great Lakes to the sea.

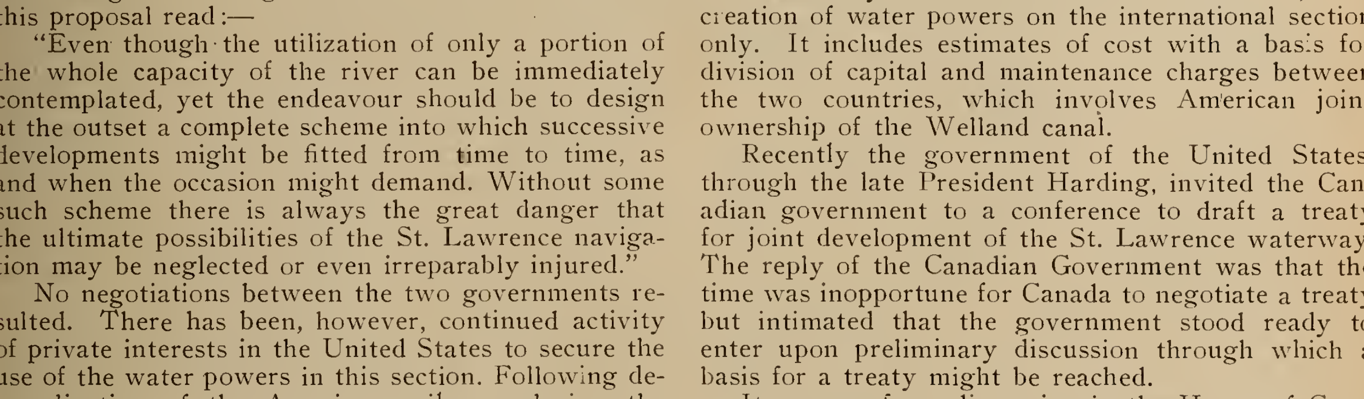
Great pressure was brought to bear upon Washington by these interests, and, as a result, instructions were forwarded to the International Joint Commission to formulate a scheme for the construction of a deep waterway, considering the obtaining of the greatest beneficial use of the water of the river in the interests of navigation and power.

The report of the commission was issued as a United States Senate document during 1922, and therein is recommended a proposal to construct a 25-foot waterway from Lake Ontario to Montreal, with creation of water powers on the international section only. It includes estimates of cost with a basis for division of capital and maintenance charges between the two countries, which involves American joint ownership of the Welland canal.

Recently the government of the United States, through the late President Harding, invited the Canadian government to a conference to draft a treaty for joint development of the St. Lawrence waterway. The reply of the Canadian Government was that the time was inopportune for Canada to negotiate a treaty but intimated that the government stood ready to enter upon preliminary discussion through which a basis for a treaty might be reached.

It appears from discussion in the House of Commons on June 12th, 1923, that negotiations have not been renewed. The engineers are using the time to good advantage in making further studies of the river and the making of various records. Activity of the various organizations in support of the waterway continues.

The policy of the Canadian government has consistently been to develop national lines of transpor-



Plan of site of proposed St Lawrence waterway and power scheme tation. The Canadian waterways are highly developed. There has been a 30-foot channel from Montreal to the gulf since 1906. The 14-foot canal system has connected Montreal with the Great Lakes for nearly twenty-five years. American statesmen have referred time and again, in admiration, to the courageous broad policy pursued by Canada in this respect. To-day there is a tendency to depart from ways of national expansion into paths international and imperial. There are, in those paths, complications and difficulties which should be avoided in dealing with questions that can be treated as purely Canadian. The St. Lawrence is a Canadian river. The great waterway development in the past has been made by Canada alone for the expansion of Canadian trade.

Principles Influencing Further Development of St. Lawrence Waterway

Three basic principles should still influence further development of the St. Lawrence waterway:—

1—National ownership from the lakes to the sea.
2—Development as and when the occasion may demand in the interests of Canadian trade and commerce.
3—The paramount importance of navigation interests over all others in the St. Lawrence.

With these principles in mind where does Canada stand in relation to the proposed extensive undertakings on the St. Lawrence river at the present time?

"The time is inopportune," is the decision of the Canadian government. Taxation is onerous; revenues fall far short of requirements; and nothing but the most pressing need could justify any great additions to our financial burdens at such a time.

The Joint Commission in their report have pointed out that there is little interest in Canada in the undertaking, the demand for it coming from the middle west states, also that the railways of Canada are considerably over-developed, and, so far as the latter country is concerned, there is likely to be no pressing need for multiplying transportation routes for years to come. They might also have pointed out that the traffic of the middle west states through the St. Lawrence canals is and always has been insignificant.

It is too vast an undertaking to enter upon without knowing the benefits to be derived and the sacrifices to be made by Canada.

The 14-foot canal system on the St. Lawrence has so far met all demands upon it and has never yet been used to one-half its capacity. The cost of the system to Canada has been many millions of dollars, and it is neither worn out nor obselete, yet the proposals include the scrapping of the whole system without even a scrap value.

The outlet for grain shipments is advanced as the strongest and most convincing argument in favour of an enlarged waterway, or as it is termed "a new water route to the sea." It was said in the House of Commons a short time ago that even if the saving on the carriage of Canadian grain was only one-and-a-half cents per bushel it was worth doing. No evidence of a convincing character, which might serve to support such a statement, has yet appeared. Not only would such a saving be entirely incommensurate with the enormous capital expenditure involved, but it is by no means clear that the same or even a greater saving could not be effected at far less cost by some other means.

In 1922, Montreal's greatest year, 77,000,000 bushels of Canadian grain passed through this port, both water and rail. Assuming that as much as 100,000,000 bushels should come down by water, the saving effected at one and one-half cents per bushel would be $1,500,000, the interest at 5 per cent. on a capital sum of $30,000,000. The cost of the waterway from Lake Ontario to Montreal is given by the commission's engineers as $252,000,000 and it is not improbable that this amount may be greatly exceeded or even doubled.

It may be noted that the total amount of export grain coming through the port of Montreal in 1922 was 155,000,000 bushels, there being 78,000,000 bushels of American grain. The heavy American shipments over this route are partially accounted for by the incapacity of the railways between Buffalo and New York as an aftermath of the railroad strike. Where they were expected to handle a thousand cars of grain per day they fell down to about two hundred cars.

During the past two years and this year also, there has been more or less congestion in the handling of grain in the port of Montreal. There are several reasons for this condition. During 1921 lack of co-ordination in the use of port facilities was a factor, also the grain handling facilities were at times overtaxed. Inability of foreign markets to absorb the grain offering has been the greatest factor in retarding its movement, and delaying shipment. Grain shipped to the port and held pending sale hampered the elevators.—There was not enough storage to absorb this element. Frequently, 25 or more lake vessels are awaiting their turn to discharge at the elevators. Even under those circumstances the elevators are frequently handling only about 600,000 bushels per day whereas their capacity is fully 1,200,000 bushels per day. The canal system has never been a factor in these delays.

Additional grain handling facilities, now under construction at Montreal and lake ports which involve a comparatively very small outlay, should so lower the cost of transportation between the head of the lakes and the seaboard as to effect the saving of one and one-half cents per bushel claimed for the 25-foot water way.

Important Questions to be Settled

There are some very important questions to be definitely settled before there can be any satisfactory basis for a development of this waterway.

The Honourable George P. Graham, in reply to questions in the House re St. Lawrence waterway, recently said that there are other interests besides the Dominion of Canada and the United States government concerned in the proposition. Provincial authorities had something to say in the matter and there had been some disagreement between federal and provincial authorities on the question of legal rights. The construction of the St. Lawrence deep waterway would mean a great development of important waterpower. The government hoped when the work was completed, to recover a sum which would come from the United States to help in its construction. Mr. Graham said that the United States had not accepted the recommendation of paying her share of the cost.

It is true that the Hydro-Electric Power Commission of Ontario have laid claim for that province to the water powers in the international section of the river, and a dispute arises as to how much power the federal government could claim in connection with a navigation project. Independent surveys of the power section were made by the Hydro-Electric Power Commission for the express purpose of reinforcing that claim. The state of New York has asserted its right in the water powers and disputes the authority of the federal government of the United States to enter into a wholesale power development scheme on the St. Lawrence at the expense of the state. Until the legal rights in the St. Lawrence of the two contracting parties, the federal governments, have been clearly defined, and the extent of provincial and state rights ascertained and delimited, no effective compact can be formulated.

In the proposals of the Joint Commission, we find costs allocated as follows: The capital cost of "navigation works" and of the new Welland ship canal to be apportioned between the two countries on the basis of the benefits to be derived by each country from the use of the waterway, etc.

Should Americans develop a preponderant trade through the canals, Canada will have automatically surrendered ownership and control of her whole navigation system on the St. Lawrence, even in Canadian territory. On the other hand, if American traffic be diverted through southern channels, rail and water, Canada would be left to bear the whole cost of the improvements which were made largely for the benefit of our neighbors.

Is it possible that any Canadian government would sell a controlling interest in the Welland canal, or permit the United States to have proprietary rights in all Canadian waterways from Cornwall into the port of Montreal? Is that the source of the sum to be recovered from the United States to aid in its construction? Is it likely that the United States would spend that money in a foreign state without exercising control over their interests?

Diversion of Water Through Chicago Drainage Canal

The extent to which diversion of water from the St. Lawrence is to be permitted, and the effects of such diversion upon both navigation and water power should be clearly determined in advance of adoption or even formulation of any general scheme of development.

Diversion of water from lake Michigan at Chicago through the drainage canal has continued since 1900. The first amount taken was about 4,000 cu. ft. per sec. Gen. Bixby, U.S. Army engineer, says that although granted a permit for 4,000 cu. ft. they were constructing works to take 14,000 c.f.s.

United States Secretary of War Stimson, in refusing an application to increase the amount of diversion to 10,000 c.f.s., said:—

"The sanitary canal has never received the direct sanction of Congress." "It was built solely under the authority of the state of Illinois." "Very careful consideration leaves no doubt in my mind that the withdrawal of 10,000 c.f.s., would substantially interfere with the navigable capacity of the Great Lakes and their connecting links, the Welland canal and a number of canals on the St. Lawrence river." "The available depth of water over one or all sills of each of these canals would be affected and in some cases reconstruction might be made necessary."

Despite this refusal the capacity of the sanitary canal has been increased. The completion of the Calumet-Sag channel in 1919 increases its capacity to 14,000 cubic feet per second. The attitude of the state of Illinois in this matter would appear to be that of the president of the sanitary district who said:—

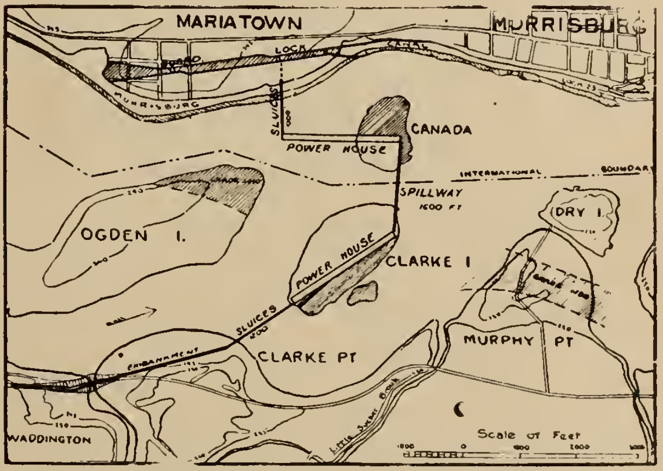
"The presumption that our water supply is to be limited to 10,000 c.f.s., is gratuitous and mischievous and should not be voiced by the officials of this district. I believe that we should have the volume requisite to our needs as they appear and are justified."

In May last engineers of the sanitary district were investigating the possibility of a regulation dam at the foot of Lake Huron with a view to a greater flow through their canal. Fortunately Canada is in a position to defeat this move.

W. J. Stewart, M.E.I.C., engineer for the Canadian government, re proposed improvements in the Livingstone channel at Detroit in 1913 said:—

"There is no guarantee as to the amount of the diversion through the sanitary canal, and it is therefore impossible for any body of engineers to construct any work to give the maximum benefit..."

The effects of the diversion are already serious in the port of Montreal and in the ship channel below. At the Montreal hearing of the International Joint Commission in October 1920, among other evidence given was reports on loss of level in Montreal harbour and the ship channel due to the Chicago diversion, by prominent hydraulic engineers, Arthur Surveyer, M.E.I.C., Walter J. Francis, M.E.I.C., and the late Professor C. H. McLeod.



Site of proposed dam at Rapide du Plat

It was shown that a diversion of 8,000 c.f.s. at Chicago caused a direct lowering of the level in the harbour of from 9 inches to 9½ inches during the low water period of the navigation season, while a diversion of 14,000 c.f.s., will lower the harbour level nearly 17 inches at low water stages. The loss of level in the ship channel will be from one half to two-thirds of that in the harbour. The resulting loss to shipping is understood when an extra inch of water gives from 40 to 80 tons additional cargo capacity.

In the St. Lawrence canals, at times during the navigation season, there has been less than 13 feet of water on the lock sills instead of 14 feet for which they were designed.

Loss of Power to Canada

The plans of the sanitary drainage canal include state owned power plants with an aggregate capacity of 173,000 h.p., according to the statement of one of the canal engineers. Secretary Stimson, in refusing the application for 10,000 c.f.s., points out that for every horse power realized by this water through the drainage canal, four similar units would be produced if it passed over Niagara. A development of 173,000 h.p., or the use of 14,000 c.f.s., of water by the drainage canal will rob Canada of her water powers to the following extent:—

In Niagara: 173,000 × 1.25 = 216,250 h.p.
In St. Lawrence: 82% of 173,000 × 1.64 = 232,550 "
Total = 448,800 "

Sir Adam Beck is reported to have stated recently that from 8,000 to 10,000 c.f.s., are now being diverted at Chicago, and that such diversion means a loss of about 300,000 h.p., to Canada. This, he said, was the equivalent of about 3,000,000 tons of soft coal, which at present prices means an annual loss of $21,000,000. On the same basis the full development contemplated at Chicago would increase this annual loss to nearly $32,000,000.

Hence the completion of plans now under way in the state of Illinois will prove very expensive for Canada.

First — The St. Lawrence canal system will have lost more than a foot in depth at the critical stages of the river.

Second — Water levels during the same periods in the ship channel will be lowered more than a foot and in the harbour of Montreal nearly two feet.

Third — The loss of water power in the Niagara and St. Lawrence rivers will be nearly 450,000 h.p.

Fourth — All harbours in lakes Huron, St. Clair, Erie and Ontario will lose in depth from 6 inches to a foot.

The report of the International Joint Commission, while recognizing that a diversion takes place, treat it as an unknown in the equation and have no suggestions to offer. They base their estimates on the assumption of no diversion. This is too important a question for everybody to sidestep. It calls for settlement.

Development of the French River for Navigation and Power

Another question worthy of consideration is the early development of water powers on the French river. There is to-day a serious shortage of power in the mining districts of northern Ontario. This power is well placed for their use and not costly to develop. The prosperity of this district is of the utmost importance to the province of Ontario. Wise co-operation in its development will yield bountiful returns. Power is an absolute necessity to the mining operations.

Coupled with such a power development should be the opening of a waterway for lake vessels up to North Bay, which becomes an important port for the handling of coal, timber, ores, etc., while grain eastbound landed there has a down grade all the way to tide water. Much heavier trains can be hauled from that point than from the Georgian Bay ports.

In the Ottawa river itself, power developments could be made from time to time in conformity with a general scheme which would safeguard the interests of navigation, and, when conditions would justify, the waterway should be completed between North Bay and Montreal, giving an all-Canadian route, the shortest possible from the head of the lakes to the sea.

Such a route will not be prejudiced by possible international complications, and is the only one which is not injured by the withdrawal of water at Chicago or elsewhere.

It is stated a million horse power on the Ottawa would result from this policy and storage works contemplated on its tributaries would add more than another million horse power, all of which is Canadian.

Insufficient Data

The Joint Commission gave their engineers but one year in which to prepare a report on the whole problem of the St. Lawrence waterway. They were not given a fair chance. It was necessary to formulate a proposal and collect what information could be gathered in the short time bearing on that one phase, in order to make an approximate estimate. This is recognized in the report itself which reads:—"that before any final decision is reached, the report of the Board, etc., be referred back to the Board enlarged by other leading members of the engineering profession to the end that the whole question be given that further and complete study that its magnitude and importance demand."

The Canadian engineers have at the present time excellent studies of the river in progress and will, when called upon, be in a position to criticize, favorably or other wise the estimates and proposals so hastily prepared.

Engineers Differ Widely on the Effects of Regulation

Nearly a dozen schemes for regulation of levels of lake Ontario have been advanced by various engineers, the American and Canadian engineers submitting separate reports on this subject. It has been claimed by some that it will result in higher high-water stages and lower low-water and by others that there will be an equalization of flow. The fear has been expressed that regulation may be in the interest of power and that navigation interests may suffer.

However, it is generally conceded that a successful regulation in the interest of navigation and afterwards of power is the basis of any satisfactory plan for a deep waterway, and no definite project can be formulated until the effects of regulation are known.

Power Proposals

"The Commission believes that the greatest beneficial use of the waters of the St. Lawrence River between Montreal and Lake Ontario may be obtained by a combination of navigation and power development in the international section and of navigation alone in the national section with power development therein at some future date.

"While 4.000,000 h.p., may be developed between Prescott and Montreal, it would be unwise, at the outset, to create more than 1,400,000 h.p. available on the international section."

So far as Canada's best interests are concerned it would be wise to split up the 1,400,000 h.p., block once more and make an even smaller initial investment.

The Hydro-Electric Power Commission of Ontario estimates that a normal growth will create by 1941 a demand in Canada for St. Lawrence power, within a 200-mile radius, of 191,000 h.p., and it may be pointed out that there will be several other Canadian water-powers competing to supply the same area. The state of New York is not asking for this 1,400,000 h.p., development but is strongly opposing the project. Canada's share of the power created might be exported, but to-day there is genuine anxiety concerning the exodus of Canadian workmen over the line to the south. The export of a large block of power to New York and New England would only have the effect of aggravating an already undesirable situation.

The engineers of the commission report in favour of a single-stage power development by means of a dam at Barnhart's island, Long Sault rapids, with an effective head of about 74 feet. A regulating dam with low head is placed near Morrisburg.

Other engineers strongly advise that power be developed at both dams. This proposal is more in line with Canadian interests since damage from flooding through change of levels is greatly reduced. The area on Canadian side is an early settled and wealthy district. One dam could be set in operation years before the single-stage power can be put into use. Under the commission's proposal the power houses are less expensive but dams and retaining walls are higher and longer and in consequence more costly.

Proposal for Erection of a dam at Rapide du Plat for Regulation of Lake Ontario and Development of Water Power

The proposal which follows will in the writer's judgment afford a practical working scheme which can be carried out at comparatively low cost, will avoid many of the difficulties incident to the plans recommended by the commission, will meet all power requirements for years to come and will have other striking and important advantages.

The diverse views held as to the effects of regulation show that the only safe course is to build the dam and learn by actual observation how the best results may be obtained. Place the dam at Rapide du Plat and make use of the power created through change of levels. Once conditions of flow are thus established, the engineering problems involved in future development of the lower river will be greatly simplified and results definite.

The benefits to Canada through the building and successful operation of this dam will be numerous and important.

1.—Correct regulation of flow in the interests of navigation will minimize the evil effects of diversion from the Great Lakes. This should restore to the St. Lawrence canals the 14 feet of water for which they were designed and built. Montreal harbour and the ship channel will benefit during low water stages. (Water power lost by the diversion cannot be restored.)

2.—Sufficient water power will be developed to meet all requirements in this district for probably 25 years.

3.—National control of St. Lawrence navigation retained.

4.—On completion of the Welland canal, upper lake carriers can proceed to Morrisburg before transferring their grain cargoes.

Physical Features

1.—An international dam to be placed opposite Morrisburg, extending from Clark's point on the American shore across Clarke's island and Canada island to Mariatown on the Canadian side, having a total length of about 8,000 feet and developing approximately 600,000 horse power under a 27-foot head.

2.—Regulating sluices between Clarke's point and Clarke's island on the American side and between Canada island and the Canadian bank of the river. The upper pool to be that of lake Ontario regulated level less the river slope from the lake to the site of the dam. The conditions in the lower pool will be equalized by some improvement of section at Murphy's point and farther down stream.

3.—Lift lock and guard, to be built at the Canadian end of the dam in Mariatown to take place of the Rapide du Plat section of the 14-foot canal now in operation. This part of the work can be constructed without interfering with navigation in the existing canal.

4.—American power house situated on Clarke's island and wholly in the United States will form a part of the dam. Canadian power house with base on Canada island and extending directly upstream lies wholly in Canada. Power houses are both so located to get the best results under winter conditions.

5.—The distance between power houses at the lower end is about 1,600 feet. This forms the spillway section and includes ice sluices and also additional regulating sluices if desirable. The International boundary passes between the two power houses near the centre of the spillway.

6.—Enlargement of section from site of dam upstream to Chimney point to be made during construction of dam and afterwards until sufficient section is obtained to give the most favourable conditions in winter as to ice cover, etc. Excavation will proceed at the critical sections where loss of head is found to be greatest. A certain amount of cutting is required also below the dam, principally cutting through Murphy's point.

Cost Apportioned

7.—Dam, spillway sluice section and other works, together with the power house, etc., lying in the United States to be built and finished entirely by American interests. Dam, spillway, sluice section and other works, together with the power house, etc., lying in Canada, to be built and financed by the Hydro-Electric Power Commission of the province of Ontario. The location makes this practically an equal division of cost.

8.—Land damages and all costs incurred through flowage, etc., due to change of levels to be assumed by the said American interests in the state of New York, and by the Hydro-Electric Power Commission in the province of Ontario.

9.—Cost of locks, entrances, bascule and navigation works required to replace existing navigation facilities to be paid in equal shares by the said American interests and the Hydro-Electric Commission. In case the Canadian government should require the lock and approaches to be in conformity with the construction on the new Welland canal, the additional cost over that of a 14-foot waterway is to be a direct charge on navigation.

10.—Excavation and other improvements in the bed of the river and elsewhere for the purpose of enlargement of river section to be assumed in equal shares by the above named power interests.

11.—Maintenance of navigation structures and facilities to be the care of the federal government of Canada. Maintenance of regulation system of sluices, etc., at site of dam to be equally the responsibility of the federal governments of Canada and the United States. Power plants are maintained by the respective power interests.

Control

12.—The regulation of river flow and lake levels to be vested in the hands of an International board of engineers appointed by the two federal governments concerned. Regulation is to be entirely in the interests of navigation and of public safety. The Canadian section of the board of engineers should be headed by the chief engineer of the department of railways and canals.

13.—The Canadian government to own and control the navigation facilities as a part of the present canal system.

14.—The power interests concerned to own and control the distribution of the power resulting from regulation excepting only that portion required for the operation and uses of the local navigation system.

15.—It is suggested that the surveys required and all additional study of river conditions required, be made by the federal governments concerned, the location, design and character of all structures and undertakings being subject to their approval.

16.—The execution of the work to be placed under one definite control, a responsible body of construction engineers of experience. Four years is a generous allowance for completion of the work as outlined and establishing full regulation.

Construction Features

The construction features do not present any extra hazardous or perilous undertakings. All structures are carried to bed rock wherever advisable, the rock being found everywhere at a reasonable depth. On the lock site, elevation of rock is approximately 190, which corresponds closely with grade for the 25-ft. channel. Canadian power houses and sluices are on rock from elevation 168 on Canada island to 185 at the north shore. Spillway foundations are at approximately elevation 170. American power house foundations go as low in one place as elevation 150, while the adjoining sluiceway footings will be on rock from elevation 170 to elevation 200, or higher.

The location is excellent for handling the flow of the river during construction. The American power house will be built without cofferdams, and the Canadian power house interferes very little with the natural flow of the river. The spillway section obstructs a small channel of probably less than 5,000 square feet in area.

The lock and canal will be built entirely in the dry without interfering with the present 14-foot navigation. Enlargement of section up to Prescott will begin with the building of the dam but it may be carried on and completed years later if it be found desirable to extend the time for that outlay.

The claim is being repeatedly made that the power developed in the St. Lawrence will pay for the whole deep waterways project. The opinion is shared by Ex-Governor Allan, of Kansas, O. E. Fleming, president of the Canadian Deep Waterways and Power Association, J. H. Duthie, secretary o the National Waterways Association of Canada, and others. They contend that the whole construction will not cost Canada one dollar, a statement which will bear many interpretations.

Here at Morrisburg is an excellent opportunity to secure an extensive water power under the most favourable conditions for establishing the above claim. As a business proposition it is not burdened with heavy capital charges due to navigation interests. The conditions are essentially fair, the interests which directly benefit paying the cost of development.

The machinery is already in operation for handling international questions that will arise as to ownership, construction and maintenance. Aside from the actual preparations for and supervision of the undertaking, the federal governments concerned are called upon to finance only in the maintenance of navigation and of stream control.

[Paper presented before the Montreal Branch of the Engineering Institute of Canada]

Old Roads Make Good Roads

Macadam Pavements that Have Been Carrying Traffic for a Number of Years Need not be Torn up but Can be Made to Give Useful Service

By J. E. Pennybacker

Two distinct problems confront the highway engineer who must spend highway revenues in the best interest of the taxpayer:

One, to salvage the old pavements with a view to utilizing as large a proportion of the original investment as possible; and, second, to construct new pavements at the most reasonable cost consistent with service and durability. A large proportion of our highways consist of waterbound macadam pavements. It is little short of an economic crime to dig up these old macadam pavements and replace them with an entire new pavement, thus ignoring the excellent foundation value of the old macadam. The material in these old pikes has been compacted under years of traffic to a degree of stability which could hardly be approached by entirely new construction. During the process of compacting the weak places, both in the subgrade and in the pavement, will have been shown up, so that repair and replacement can be intelligently conducted without sacrifice of those portions of the old pavement which are in good condition. When it is considered that the stone or gravel constitute by far the heaviest portion of a pavement the saving in the cost of quarrying, transporting and placing this great mass of material becomes an item well worth while. For conserving these old macadam pavements an asphaltic wearing course is ideal. The reasons are simple and convincing:

First, asphalt is waterproof and an asphaltic mixture, therefore, protects all pavements from their deadliest enemy, water.

Second, because an asphalt mixture is dustless and thus protects the pavement from ravelling and blowing away in the form of dust during dry weather.

Third, because an asphaltic mixture is flexible and resilient and therefore takes up the shock of impact. As an illustration of the importance of this impact resistant quality it has been ascertained by the United States Bureau of Public Roads that a rear truck wheel, with a load of 7,500 pounds resting upon it, delivers to a pavement when the wheel is moving at 15 miles an hour, with only a one inch drop, a blow equivalent to the weight of more than 42,000 pounds.

Fourth, because the asphalt wearing course can be laid in a course as thin as two inches and still conform to good engineering practice so that wherever the old pavement has an adequate thickness the great cost of laying a thick new pavement is cut down to a minimum by using the two inch thickness.

Fifth, because asphalt enables the use of a local material which would be unsuitable for other forms of construction. For example, a hard stone which has no cementing value and is, therefore, unfitted for waterbound macadam can be used with asphalt because the asphalt provides the binding power which the stone lacks. In another case a fairly soft stone which would not be hard enough for portland cement concrete may be used with asphalt, for even if the stone breaks down it forms with the asphalt a tough mastic similar in some respects to a rubber mat.

Sixth, because the asphalt wearing course is easily repaired if any part of it should become defective and, when properly prepared, the pavement is absolutely restored, the new asphalt blending with the old mixture.

Important to Utilize Old Pavements

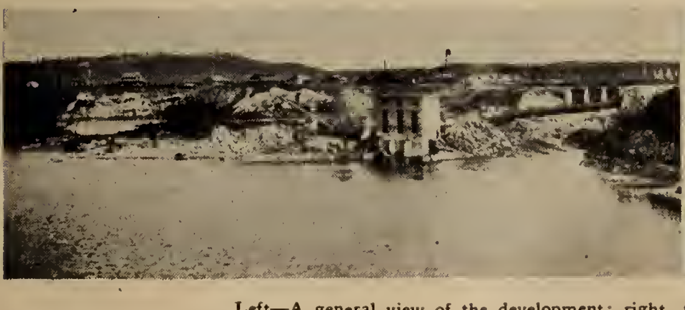
Some engineers figure a pavement as having two dimensions, width and thickness, but the most important dimension of all is length. The people today need an enormous mileage of highways. If a few miles of a very costly type of pavement are laid and a gap road is left between the terminus of the pavement and the ultimate destination it is much the same as building a bridge half way across the river and waiting a few years to build the other half. It is not only common sense but a civic duty to utilize fully every existing asset in the way of old pavements in order to get mileage.

The second problem, that of providing new pavements, involves the consideration of a very wide range of highway method and design. A few years back the so-called city types of pavement were regarded as beyond the reach of the country road builder because of their great cost. That was in the days when a $5,000 to $10,000 per mile outlay was regarded as quite liberal. Today, the country highway which costs less than $30,000 per mile is either regarded as a shining example of extreme economy or it is relegated to the ranks of the "cheaper types." Now when we go into cost levels such as these we are abreast of the city paving types and it is entirely practicable for the farmer to drive from the market to town on a city type of pavement and pay no more for it than he is now paying for other types of country roads. It is inevitable that those pavements which are able to withstand the gruelling wear and tear of city traffic are capable of withstanding any traffic to which a country highway will be subjected. The reason the city asphalt type of pavement can be constructed for little if any greater cost than bare concrete is because the use of the asphalt top eliminates the necessity for a rich concrete base. In other words, where the asphalt top is not applied the portland cement is used in the proportion of one part of cement to 4½ parts of sand and stone, while in the cases where an asphalt top is used the portland cement in the base is one part of cement to nine parts of sand and stone. Further, while in the case of the portland cement pavement a metal reinforcement is usually required, this is not needed in a concrete base surfaced with an asphalt top. These modifications bring the two designs fairly close in comparative cost. This comparison is not intended as in any sense derogatory to the portland cement concrete type of pavement but to emphasize the fact that the city type of asphalt pavement is not unduly expensive.

On the Pacific Coast there has been widely developed over a period of twenty-five years a type of pavement and foundation which is resilient and flexible and has the ability to resist the encroachment of water. This pavement is known as the asphaltic concrete base type. Its more common name is that of "black base." This type is not patented or controlled by any company or individual and is laid at a moderate cost.

It is simply a foundation of three or four inches of mixed stone and asphalt on which is placed a wearing course of recognized sheet asphalt or asphaltic concrete. This gives a total thickness of five or six inches of pavement and foundation which has been found ample. Where the subgrade is unstable it is good practice to lay a thin insulating course of four inches of broken stone. Engineers familiar with this type of construction claim that it will successfully resist the bombardment of heavy traffic and is, therefore, distined to become a standard in eastern paving practice within a comparatively few years.

Scenes from the Great Northern Power Co's Hydro-Electric Development at Indian Chutes on the Montreal River



Left—A general view of the development; right, transformers being loaded on scows at Elk Lake

Ventilation of Electrical Stations

The Difficulties of Adequately Ventilating Some Types of Substation Buildings—Apparatus Necessary—Means of Exhausting the Stale Air

Electrical central and sub-stations often present some difficult problems for the ventilation contractor. Due to the nature of electrical apparatus, air must be supplied to keep them cool. Any temperature rise above a specified normal may prove disastrous and consequently, the air cooling supply must be certain. Inasmuch as any temperature rise in the machines raises the temperature of the air in the station itself, the ventilation of the station is closely tied in with the ventilation or cooling of the apparatus.

A very comprehensive bulletin on this subject has been issued as a report by a sub-committee of the National Electric Light Association. From this report some extracts are given herewith as being of interest to ventilation engineers and contractors.

Necessity for Mechanical Ventilation

The demand for constantly increasing sizes of transformer and converter units within floor areas no larger than were formerly used for the smaller units, has resulted in the introduction of mechanical means for removing the excess heat.

To take care of the situation, mechanical means for removing the air, which have been commonly referred to as ventilation but which more properly speaking should be classed as air cooling equipment, have been designed where fans working under pressure are demanded.

The manufacturers of transformers and rotary converters are insisting upon a strict compliance with the specification requirements for air and find the requirements so far demanded are in some cases below the actual requirements which experience has indicated.

Since it is required to operate these machines at their full overload capacity for short periods of time, it is a matter of prime importance to install ventilating apparatus that will insure satisfactory results.

Confinement within Closed Walls

In congested districts where it becomes necessary to build between existing buildings, the substation structure demands making use of openings in the front, rear and roof only. If a one story structure were possible, natural ventilation might be obtained through sky lights in the roof, but property values are so high that it becomes necessary to build a three, four or even five-story structure, the converter room being on the first floor. The room in which the heat is liberated is therefore a closed box in which a very rapid rise in temperature would take place unless mechanical means for changing the air were liberally supplied. To prevent the mixture of the incoming and outgoing air, the ducts must be carried through the upper floors.

Concentration of Larger Units

In the large substations a capacity of 28,000 kilowatts has been confined within an area of approximately 4500 square feet or over six kilowatts per square foot. This construction of units is peculiar only to large cities, but has been worked out very successfully both from the standpoint of ventilation and also from the standpoint of feeder distribution.

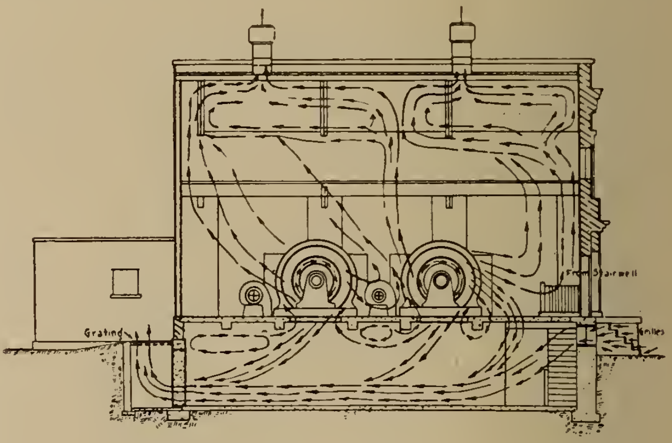
Volumes

The amount of air required under the specifications of the manufacturers in a station of five 4000 kw. converters based on 12,000 cubic feet for each transformer and 25,000 cubic feet for each rotary converter is 185,000 cubic feet of air per minute. All of this air must be handled mechanically and must be taken from points insuring reasonable cleanliness.

In order to guarantee each piece of apparatus its proper quantity of air, individual blowers must be introduced at each machine and a general system of exhaust must be introduced to prevent these individual blowers working against an abnormal pressure in the room.

Admission of Air to Converter Room

In selecting the point of admission for fresh air, care must be taken to avoid drawing any of the air over the sidewalk which is usually heavily laden with dust and such point must be remote from the point of discharge. Since in the city of New York the building code requires a set back in the building at the rear so that not more than 90 per cent. of the area of the lot may be occupied at a height of 23 feet above the curb, an excellent opportunity is afforded to secure a source of fresh air at the rear of the building, the air being admitted from a point 23 feet above the curb and remote from the sidewalk where the air will probably be found as free from dust and dirt as it would be possible to secure.



Cleveland Railway Co. Substation. Automatic control—longitudinal section

Air Washers

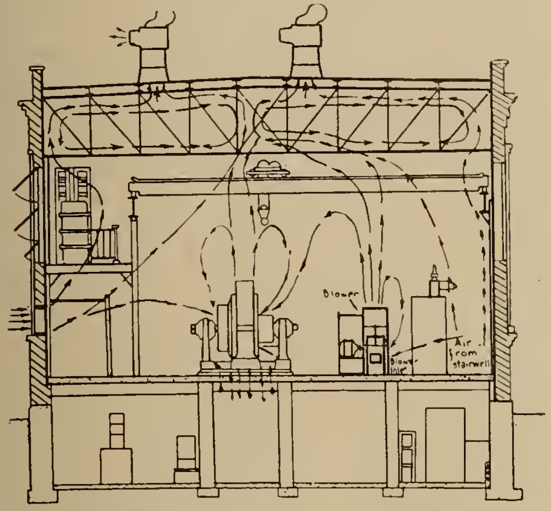
In many of the designs of the recent stations it has been found possible to provide a space in the basement near the point of admission from the rear of sufficient size to introduce an air washer. No air washer, however, has as yet been introduced and the question is still being debated as to whether an air washer will be required at any time.

Provision Against Snow and Rain

On account of the high velocity of the incoming air, rain and snow are drawn in, and in extremely cold weather, snow is frequently drawn in to the nearest machine. To provide against this shutters are introduced in the air passageway which may be quickly closed, cutting off entirely or throttling the incoming air. At the bottom of the air intake a drain is provided connected directly to the sewer or a sump pit.

An effort is made to so design the inlet that an average maximum velocity of 1200 feet per minute will be insured.

The heated air from the various machines rises directly over each machine to the ceiling and the exhaust system must be so designed that this heated air can be picked out at various locations near the ceiling. Unless this be done, portions of the rooms, particularly those remote from the front openings, will be abnormally heated and the machines in the rear of the room will feel the effects of the high temperatures of the atmosphere of the room.



Cleveland Railway Co. Substation. Automatic control—cross section

Duct Construction

The air duct in the rear leading into the fresh air chamber in the basement prevents the installation of windows and the only natural opening to the outer atmosphere is in the front of the room, which in hot weather is kept opened by the station operators. If the exhaust system which is frequently taken up in the front of the building is not distributed over the entire area of the room by means of ducts, there is the short circuiting of air from the front doors and windows directly into the exhaust duct, thereby defeating the purpose of the exhaust.

Interference of Ducts on Ceilings and Collapsible Ducts

The ducts that are carried over the ceiling of the converter room are made collapsible or removable wherever there are crane interferences. The exhaust duct passing up through the building to the blower pent house on the roof is built in with the masonry construction and plastered or finished smooth on the inside to reduce friction.

Vent on Roof

The warm air exhaust through the roof fans is in many cases discharged at points lower than the neighboring buildings and in the summer time when the windows are kept opened and the air is particularly warm, great care must be used to prevent annoyance to the neighbors. The exhaust must, therefore, be carried as nearly vertical as possible and located after carefully surveying the neighboring conditions.

Good results are often obtained by exhausting through holes in the roof without the introduction of pipes or ducts projecting above the roof. This removes the imaginery annoyance which the sight of an exhaust head might produce.

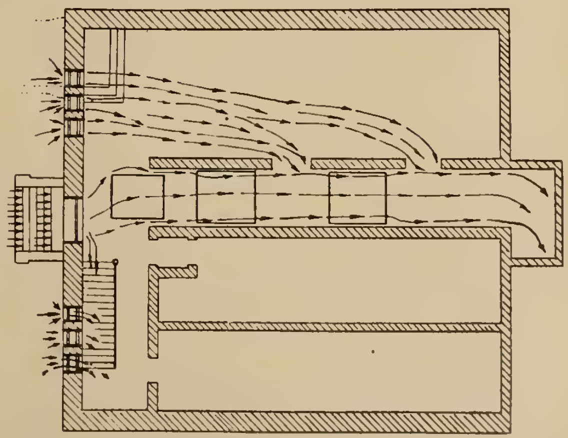
Muffling of Exhaust Air

If the discharged air is delivered at a very high velocity, a very disagreeable noise is sometimes produced which annoys adjoining tenants, particularly at night time, and efforts have been made to provide a muffler which will not decrease efficiency.

Experiments made by lining the exhaust chamber with sound deadening brick or sound absorbing material have been made but results hardly warrant any great expense in this line. If the air be exhausted into a large chamber, which in turn vents to the roof through a steel grating, the sound is hardly audible except to one standing near the grating on the roof.

Specific Cases

Investigations by the Commonwealth Edison Company over a period of five or six years indicated that while the problem is one of space ventilation, no solution was feasible without taking into consideration the ventilation of the apparatus; that is, the present type of converting apparatus required that the two problems be considered together. The problem is further complicated by the question of handling the intake and exhaust air, especially so when installing ducts in basement stations or carrying them to the top of business buildings. Further investigations also indicate that where sufficient space and openings overhead are available, the natural ventilation of machines, as now designed, is much to be preferred. In substations above the street level where the building structure permits



Cleveland Railway Co. Substation. Automatic control—plan of basement large ventilating monitors in the roof over the row of units and both ends of the substation opened by means of large doors or windows, are superior to any wall baffles or ventilating partitions such as are necessary in substations located below the street level.

For substations below the street level, as in Chicago where the intake and discharge openings are on opposite sides of the room, approximately 60 per cent. of the air was not affected in any way in cooling either space or apparatus. In other words, the air was drawn in from the intake, drifted across the ceiling and out the discharge duct. This interferes with the natural displacement of the room air rising from the units so that there was considerably more re-circulation of room air than in the substation with an open monitor. For correcting this condition, the best method was found to be by dividing the substation into two rooms by means of a partition or wall placed parallel to the row of units and so located that the commutator end of each machine just projected through the partition. This permitted all of the air drawn into the machine from the d.c. end to be taken directly from the fresh air intake and reduced the amount of re-circulation by approximately 60 per cent. These partitions were found to reduce the temperature of the air discharge over the machine approximately 10 deg. cent. on the average. This partition did not effect the usual amount of re-circulation of the air through the collector ring side of the main armature and through the booster armature. This re-circulation might be further reduced by the installation of another wall along the a.c. side of the units, but would seriously interfere with operating conditions and maintenance of apparatus. While this type of installation has not given entire satisfaction, it is thought to be the best obtainable with synchronous converters as now designed.

The conclusion has been reached that the ventilating problem for new machines can best be solved by providing a closed system on the discharge side which, of course, will call for vent ducts and exhausting fans; and further, that the intake air to the unit should be drawn from the open substation space rather than by means of an intake duct since a common intake duct to several machines does not give equal air distribution.

Basement Substations

Ventilation of basement type of substations of today has become of great importance due to the difficulty of not only getting air to the substation for room ventilation but also the difficulty of directing the air through the machines effectively and to get sufficient outlet for the amount of air required.

The Commonwealth Edison Company has done some experimental work along the lines of enclosures for apparatus; also expensive enclosures of the partition type which virtually encloses machines in a separate room have been built, but results indicate that the only satisfactory answer to this problem from a new apparatus point of view is to have the manufacturer enclose the machines in a manner similar to that which they have followed in connection with synchronous condensers. There may be some limitations to this method as regards commutators on account of the machines being placed on a basement floor instead of having a basement beneath, and there may be some other objections due to apparent inaccessibility which only operating experience can measure. In the cases where machines have been enclosed with a partition, air is drawn through the commutator which projects through the partition and a suction is maintained behind the partition to pull the heated air away from the machine into the exhaust duct. This type of construction applies, of course, where the machines are in a row with shafts parallel and is a possible solution for the older types of machines.

Battery Room Ventilation

The ventilation of a storage battery room is similar in many respects to the general ventilation of the rotary room or any other large room. The question of the number of air changes per hour must be determined by experience after observing the effects of a rapid charging or discharging of battery.

The principal problem in the ventilation of a battery room is to destroy the acid fumes before they are discharged into the atmosphere. In spite of all the efforts that have been made to destroy these fumes, it is practically impossible to obtain 100 per cent. perfection. This, however, is really not essential because the dilution of the acid laden air by the atmosphere is sufficient to destroy a large per cent. of the acid which is drawn out through the ventilation system.

The elimination of a high pecentage of the acid would naturally be followed by a very low efficiency of the ventilation system and a line must be drawn somewhere if ventilation is to be sufficiently effective to prevent the accumulation of acid and free hydrogen in the battery room.

Various forms of acid eliminators have been designed with more or less success. The introduction of a soda solution through which the acid fumes pass has shown that very little neutralization takes place and the best results have been obtained by a spray washer with fresh water and the standard form of eliminator plates. The acid eliminator must be introduced between the battery room and the fan, and even with the small percentage of acid which passes the eliminator, the fan rapidly deteriorates. A good acid proof paint will correct this trouble, but better results are obtained by a lead wash over the entire surface of the fan blades and the inside surface of the metal duct.

Power Show Includes Materials Handling Equipment

Shortage of common labor has driven the manufacturers of the country to an intensive study of the possible economies of material handling equipment in industry. The addition of material handling equipment to the National Exposition of Power and Mechanical Engineering is therefore a very timely move as it furnishes a remarkable opportunity for executives and engineers in industry to study the latest developments in this art. The Exposition is to be held in the Grand Central Palace, New York, from December 3 to 8, 1923.

The equipment to be exhibited will include conveyors of all kinds, fireless steam locomotives, industrial trucks, elevators, hoists and large scales. Many novelties are on the list and interested engineers will have an excellent opportunity to study each type, select the one most suitable for their particular problem and secure the cost data necessary for the decision.

Steel belting for conveyors is a novelty in this country and one exhibitor is to install a working model of a complete system of steel belting conveyors. The model will be one-tenth actual size.

The Wilson Dam in Alabama

The Largest Monolith in The World

Part of a Power Development That Will Involve The Expenditure of $50,000,000—1,000,000 Yards of Excavation and 1,260,000 Yards of Concrete—624,000 h.p. to be Developed

What is said to be the largest concrete dam in the World is the Wilson dam across the Tennessee River at the foot of Muscle Shoals in Northwest Alabama, U. S. A. Some interesting facts regarding this stupendous development which is primarily for the production of Hydro-electric power are given in "Scientific American" by Littell McClung.

At present, work is in five main divisions. First, there are the lock chambers for navigation over the dam at the north end. Just beyond these rises the short non-overflowing section. Across the two channels of the river and the island between them, extends the main spillway division. At the south end, against high banks, stands the half-finished powerhouse on which construction is rapidly going forward. Then, driven into the south banks for a quarter of a mile, will be the high core wall.

The two locks along the north side will have a lift of 45 ft. 6 in. each. These locks, like all the other equipment on Wilson Dam, will be electrically operated by current from the generators. Some idea of their massiveness may be gained from the fact that the lock gates will weigh 1,500 tons, and each of the 63 crest gates will weigh 33 tons. When completed, Wilson Dam will be 5,000 ft. long, 101 ft. wide at foundations, and will lift its superstructure nearly 125 ft. above the riverbed. To bring into existence such a monolith in a river where the flow sometimes reaches 500,000 cu. ft. a second, all phases of the work must be synchronized—drilling, blasting and excavating; bringing in materials for making concrete; building flawless forms; transporting concrete to these forms; and the final pouring. To consolidate these factors in a continuous manner requires 27 miles of railroad, two dozen boats and barges, a number of electrical cranes, scores of rock drills, three huge crushing and mixing plants, 30 locomotives and more than 200 cars and gondolas.

The effort is truly gigantic and in some phases quite spectacular both as to engineering and construction. This may be realized when one considers that Wilson Dam will be 81,000 cu. yd. larger than the Assouan Dam in Egypt—at present the giant among the world's river barriers.

There are few precedents to guide the various phases of the work, for the reason that this is the most massive dam ever undertaken and because it is being built in a limestone country where fissures may occur in the rock strata. While the general principles of gravity-dam construction are well known, Wilson Dam, like the Panama Canal, is a problem unto itself, and, in an engineering sense, a fascinating one.

The first natural enemy to be check-mated is upward pressure—the upward thrust of any water that may seep under the foundations. At the start, of course, the riverbed was exhaustively tested by diamond-drilling and hydraulic pressure. Then the solid rock was blasted out 16 ft. deep across the stream. Into this channel the concrete foundations of the dam were "toed," making them virtually monolithic with the natural rock.

Tunnel Throughout

Throughout the length of the dam a tunnel is being constructed through the foundations close to the riverbed. From this tunnel 6-in. holes are drilled far down into the limestone. beneath. There is one of these every 23 ft. from bank to bank of the river. If upward pressure occurs from seepage these holes will act as relief valves, taking up the water and releasing it through pipes into the river below. And through them concrete will be shot down and driven, under air pressure, into any crevices through the rock, thus permanently sealing them.

Some of the most interesting work is that on the great powerhouse that will be 1,184 ft. long. The volumes of water that will surge through the penstocks to the turbines may be envisioned when one realizes that each penstock is 12 ft. 4 in. wide and 15 ft. 10 in. high. There will be fifty-four of these—three to each turbine—and they will have a capacity of 62,000 cu. ft. of water per second.

Four of the eighteen turbines will have a generating capacity of 30,000 h.p. each. The other fourteen will develop 36,000 h.p. each. The total maximum installation will be for 624,000 h.p. And this energy, harnessed from the river's flow and pressure, will be supplemented by the 100,000 h.p. steam plant, built by the government, that stands on the banks of the river a mile below the dam.

A fine problem in engineering and construction is presented in cementing the powerhouse forever into the limestone bluffs by means of a great core wall 1,500 ft. long. This core wall will be as high as the dam itself, 7 ft. thick at the base and will taper to 5 ft. at the top. This immense, invisible water barrier, deep down in the rock under the earth, will for all time prevent any possible seepage around the power house end of the dam.

Before Wilson Dam is finished almost 1,000,000 yd. of earth and stone will have been excavated from banks and riverbed and 1,260,000 yd. of concrete will have been poured. There will be no let-up night or day until the project is completed at a cost of approximately $50,000,000.

Fire Resistive Construction as Applied to Lumber Farm Structures

Three Types of Frame Construction that Minimize the Fire Hazard—Plaster Protected Partitions and Floors Stand Severe Tests at the Underwriters' Laboratories

By THEODORE F. LAIST
Architectural Adviser of the National Lumber Manufacturers Association

It is not generally realized that progress in the direction of better and more efficient utilization of lumber in the field of building construction has kept pace with the progress so noticeable in connection with some of the newer building materials. In the field of research the Forest Products Laboratory and other institutions of learning, with the co-operation of lumber trade associations, have made valuable contributions to the lore of this old and most valuable material. But useful as these investigations have been, none of the results has been sufficiently spectacular in character to appeal to the popular fancy and to receive more than passing notice. Thus while such information has been placed in the hands of the building specialist much remains to be done to inform the man in the street.

Research in lumber has generally been directed towards the more effective treatment for prevention of decay, kiln drying, utilization of wood wastes, substitution of species, and exhaustive tests to justify higher stress values for some species. Coupled with the study of these topics are the investigations along the lines of fire prevention and the reduction of fire hazards fostered by individuals and associations more directly interested in the production of lumber.

The occasional outcry against fire waste and the beneficial results of the annual fire prevention week are small compared with the calm and deliberate study and promotion of methods which reach the fundamentals of the fire hazard problem.

The varied propaganda in the field of building material has brought out the important fact that, notwithstanding the hazards of and the losses due to fires, there are to be found no substitutes for many uses for the so-called combustible materials, particularly of lumber. What then is the next logical step to be taken by those intent on furthering better construction? Obviously, the more scientific and better utilization of the materials at hand with a view to minimizing the fire hazard.

Three Superior Types of Lumber Construction

Much can be done to accomplish this result and in three different ways; first, by the adoption in their entirety of those principles upon which so-called mill construction is based, a type of construction which finds its principal application in industrial buildings; secondly, a partial adaptation of the principles of major importance, particularly those pertaining to the avoidance of concealed spaces and ducts, carrying with it fire-stopping and the avoidance of small members wherever practicable; and third, the limited use or employment in extra hazardous positions of fire resistive construction which consists of the employment of wood covered with a material which offers resistance to fire, as for example, metal lath and plaster.

Lumber Mill Construction

Of the first type little need be said. The principles of mill construction are well understood. In Europe they have been practiced for centuries, although they may not have been formulated. The practice of using thin members is one which has developed in our own country, especially in the west. Timber has been used since the beginning of civilization and many of the architectural monuments that have been passed down to us by precediing generations are largely of this material. We need but to point to the wonderful half-timber building of the middle ages, many of which are standing today. In these the wall construction, as well as the floor beams, are of timbers of large sections with the air spaces filled with sand or other incombustible material. Air channels and concealed openings are always carefully closed. The result is that European cities are not often visited with such disastrous conflagrations as from time to time arouse our attention in this country. In the matter of pure design, other than the more scientific differentiation between grades and species in their utilization, we can hope to accomplish little more than has been done by the designers of the middle ages. We cannot hope to improve upon the wonderful designs of timber trusses with which the minor English churches were embellished. So that in our search for progress we must look for newer fields and they lie in the direction of safer construction generally, and in fire-resistive, or slow-burning lumber construction.

The principles which underlie mill construction insofar as they affect the employment of lumber are these:—The avoidance of concealed air spaces, the use of timbers of large cross section, and the avoidance of excessively large floor areas without the intervention of fire walls.

When we review the early history of frame construction in this country we find that the tendency in design was in the direction of what is now known as "slow-burning" or "mill construction." The important basic principle of this type of construction is that of the employment of timbers of large section, which was the feature of early barn and other braced frame structures.

The mill type of construction is generally accepted as one of superior qualities and offers no greater hazard than so-called fireproof construction, in fact when buildings so constructed are sprinkled they obtain the same insurance rating as if fireproof. The employment of the principles which underlie slow-burning construction have never been ertended to dwellings and farm structures. In fact, in the more recent structures the reverse is true. In our early

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*A paper presented to the annual convention of the American Society of Agricultural Engineers, held at Chicago on November 8-10, 1923.

history barns and the larger farm structures were constructed of heavy timbers.

Resistance of Heavy Timbers to Fire

Although the resistance heavy timbers offer to fire is well known few of us appreciate the terrific heat a 12x12 inch timber will withstand for an hour without being consumed to the point of failure. We fail to differentiate between large timbers and lumber of small cross section, notwithstanding the fact that wood piled up with air spaces intervening and a large log are as different in their resistance to fire as steel is from wood. It is almost impossible to start a fire excepting at the edge of a heavy timber, for which reason they are chamfered or rounded. Likewise, it is difficult to start a fire on a solid plank floor. These attributes of wood are taken advantage of in the design of lumber mill construction.

In column tests conducted by the Board of Fire Underwriters in 1919 the following results were obtained:

Unprotected timber columns failed in from thirty-five minutes to forty-five minutes while loaded with sustained load during the test of 118,500 pounds. Unprotected steel columns, under practically the same loading, failed in from eleven and one-quarter to twenty-one and one-half minutes. Cast iron columns in from twenty one and one-half to thirty-four and one-half minutes; and round cast iron columns filled, in forty-five and one-quarter minutes; and steel pipes concrete filled in thirty-six minutes.

In the application of these underlying principles of mill construction to farm structures little headway has been made; in fact other requirements have been so uppermost in the mind of the average designer that the important quality of fire resistive construction has been somewhat overlooked. Thus we see the braced rafter plank barn coming very much into vogue, and with good reason but the weakness of this type of barn as compared with the old style of heavy timber barn from this point of view is to be found in the multiplicity of small members, the failure to shut off by fire stops the lower floor from the haymow, and similar tendencies. On the other hand, the ease and speed of construction due to the light trusses are good reason for its popularity.

Plank Frame Barns

The merits of this type are succinctly detailed in a bulletin I have as follows:

"In contrast with the old clumsy timber barns we have the modern plank frame barns. The framework of these barns is constructed entirely of 2 in. plank. The amount of time, labor and lumber necessary to erect one of them is appreciably less than for a timber frame barn of the same size. If correctly designed and constructed they are stronger than the timber barns. There are several different types of plank frame barns, the most popular types being the braced rafter or balloon frame, the Sawver truss, and the Gothic roof."

While the advantages enumerated are apparent and should not be lost in the design it may be suggested that under certain conditions some concessions might consistently be made to effectively overcome fire hazard by such simple means as the combination of several trusses. Increasing the span may require heavier roof sheathing or purlins, or even a laminated type of roof construction. In order to avoid difficulty of handling and expense of timbers of large section the trusses might be built up of planks.

Likewise, in the floor of the haymow the laminated type of floor construction, consisting of 2 in. plank on edge closely laid, might well be substituted for the 2 x 10 joists, making an effective stop against the spread of fire. A laminated floor construction of 2 x 4 inch members with a span of twelve feet would be safe for a live load of over 150 pounds per square foot.

In the laminated or Gothic type of roof construction, there are fewer members, less timber, and less bracing. The scope of this paper does not permit entering into any extensive discussion of details of construction. My only purpose in mentioning these particular examples is to endeavor to turn the thoughts of the designer of farm structures into channels so that along with other requirements of barn structures greater consideration may be given to the features of construction under discussion.

Partial Lumber Mill Construction—Fire Stopping

Fire stopping is one of the essential features of the second type of construction. It has been shown that fires do not always spread through ignition by contact with a flame but often through the accumulation and ignition of combustible gases, in parts of the structure far removed from the place of the fire's origin. These gases generated often by a small fire within a restricted area frequently spread through ducts, openings, and cracks which have no reason for being and which are accidental, due to carelessness in design and construction. Their elimination is the purpose of fire stopping. The phenomena of many fires almost simultaneously starting in several places of a structure is thus accounted for. In the fire of the Chicago, Burlington & Quincy Office Building in Chicago, a high building of the most modern type, fire was communicated to the contents of some of the rooms by an adjoining fire which was exceedingly hot. The combustible furnishings on some of the floors were entirely consumed, as may be supposed, but in the lavatories which contained no combustible material whatsoever and which were separated by halls and metal doors, the marble in many instances was found to have been calcined and the metal work entirely melted, although nothing in the room itself was combustible. This is a case in which the destruction was due entirely to combustible gases communicated from a distant part of the building where the fire raged.

Such instances as these emphasize the importance of fire stopping, the avoidance of such spaces as we find around the end of the joists resting on a ribbon in balloon construction, and the almost invariable connection between the cellar or attic and the spaces between the studding in cheap house construction. There are a number of vulnerable points in house construction, the danger of which may be overcome by the insertion of wood blocking, metal lath, or brick and mortar laid on wood supports. On the care with which this is done and the avoidance of cracks and openings depends the efficiency of the fire stop.

Fire Resistive or Lumber Protected Construction

Now we come to the third and one which is the outcome of some more recent tests of the Underwriters' Laboratories made in Chicago. One of the important essentials of a mill construction building is the curtailment of large floor areas. The standard fire wall as prescribed by the Underwriters is a brick wall, ordinarily not suitable, not only on account of cost but for other practical reasons as well.

These tests have successfully consummated the long quest for an economical type of construction which would provide an inexpensive means of adequate fire protection suitable for the average farm structure or home.

One set of tests was made on partitions constructed of wood studs, metal lath, and gypsum plaster; and the other on a floor of the ordinary type of joisted construction. The test to be regarded as successful was required to withstand safely the fire test for one and one-quarter times the period for which the classification was desired; secondly, to withstand the fire steam test; and third, that no flame shall have passed through the partition during the prescribed fire period. The transmission of heat through the partition during the prescribed fire period shall not have been such as to raise the temperature on its outer surface in excess of 300 degrees F., and finally, the partition shall not have been warped, bulged, or disintegrated under the action of the fire or water to such an extent as to be unsafe.

Inasmuch as the classification asked for metal lath protected lumber was one hour, the fire in one test was to be continued for not less than one hour plus twenty-five per cent or one hour and fifteen minutes, and the fire steam in the second test was to be applied at the end of forty-five minutes.

Partition Test

The first partition test was made on a full-sized panel ten feet wide by eleven feet high, plastered on both sides with three coats of gypsum plaster three-quarters of an inch thick. Observations were continued for three hours and one and one-half minutes, at the expiration of which the fire passed through the partition which was then withdrawn from the fire.

In the second test the fire was extinguished at the end of the seventy-five minute period. The highest temperature on the unexposed surface was 176 degrees F. at seventy-five minutes and not a single crack or crevice appeared on the plaster face and the standing finish was unimpaired without mar or stain. Despite the fact that during a good part of the test the flames were impinging directly on the plaster finish, the depth of the charring on the studs ranged from a mere discoloration to 5/16 inch near the middle of the sample, while in most cases the studs were not discolored.

Floor Test

The floors used in the test were of ordinary wood joisted construction, 2x10 inch yellow pine joists spaced 16 inches on centres with a clear span of about thirteen feet cross-bridged at the centre. Rough pine flooring with a nominal thickness of 7/8 inch was nailed to the upper side of the joists and covered with Cabot's quilt lapped about three inches at the edges. Over the quilt and parallel to the joists 2 x 2 in. wood sleepers were nailed to the rough flooring at about 16 inch centres. After that a 1 x 4 inch dressed and matched pine, finished floor was blind nailed to the sleepers. The underside of the joists was metal lathed and plastered with gypsum plaster.

The test on the floor to be regarded as a success was to meet two conditions, one that the floor shall have sustained safely the full-rated safe-working load during the fire test without passage of flame for a period equal to one and one-quarter times that for which the classification was desired, which was one hour in this case; and the second condition to be met was that the floor shall have sustained safely the full safe-working load during the fire steam test and after its completion shall sustain a total load equal to the dead load plus two and one-half times that of the live load for which the construction was designed.

After the test and the removal of the load it became evident that, with the exception of a few discolorations, the top of the finished floor showed no trace of fire, nor did the furring strips or the Cabot's quilt show any trace of fire. The removal of the rough floor showed considerable smoke stain but only the undersides of the joists were charred, ranging from practically nothing to a maximum of about 5/16 inch. The small loss in effective cross-section was negligible.

Conclusions

This construction having thus successfully met the requirements for durability, strength, fire-retarding properties and stability specified by the conditions of the standard fire test, the Fire Council of the Underwriters' Laboratories approved the recommendations of its engineers and on November 8th, 1922, awarded a one-hour rating to the metal lath protected wood studded partitions and, likewise, accorded a wood joisted floor, protected on the underside with metal lath and plaster, the full hour rating. In this connection Mr. Dana Pierce, vice-president of the Underwriters' Laboratories stated:

"This discovery of the fire-resistive properties in an ordinary priced partition marks an epoch in the science of construction. It is a new contribution to the art of building that has wider possibilities than we may foresee today. This material has a higher 'time rating' than we or any one familiar with building materials had expected. The whole experiment has proved that there is an unexpectedly good resistance to fire in a type of partition which has not been generally considered fireproof, and now is recognized as more nearly equivalent to strictly fireproof construction than any other building material."

The practical application of these partitions and this type of floor construction in farm structures may be left to the initiative and ingenuity of the designer. such practical applications at once suggest themselves. For example, the separation of the ground floor of the barn from the haymow above; in very long barns, dividing the haymow into sections by means of light partitions of this type, the separation of dwellings from garages, shops from the implement shed, and furnace or boiler rooms from dwellings, or dividing implement sheds in which expensive machinery is stored, or storage rooms into compartments so that if a fire does break out in one section the loss need not be a total one.

The failure to insist on precautionary measures, which at the time they are suggested seem to be of such slight significance and their need so remote to evoke indifference and ridicule, at some time may play a very important part in the lives of men. The most unimportant measure may be instrumental in the avoidance of a casualty which might be tragic in its consequences, or the cause of enormous property losses.

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"White Collar" Jobs and the Building Industry

We hear a great deal these days about "white collar" jobs and their effect on apprentices in the building trades. We are told that the preference for such a type of employment on the part of young men accounts largely for the dearth of building mechanics and the consequent labor shortage and high wages in the skilled trades. It is undoubtedly true that with the superior education that boys receive to-day, there is a tendency to look upon manual labor as somewhat undignified. "White collar" jobs seem to offer easier hours, better prospects and greater remuneration and, consequently, are very alluring to the young man who is just commencing his life's work.

While it may be a fact that office and other so-called "genteel" employment has militated against an adequate supply of mechanics in the building trades, this situation cannot be indefinitely prolonged for the reason that the demand for men to fill "white collar" positions will reach a limit. Our industrial fabric depends on both manual and mental workers and there must be some fairly definite relationship between the number of each. At all events, the business of the country cannot be developed through the efforts of one class of workers alone. This intimates a limit to the number of entrants into "white collar" ranks and when that limit has been reached, the flow will turn towards the ranks of the mechanics. The mounting wages which a scarcity of manual workers entails acts also as an inducement for young men of apprentice age to consider seriously the prospects of such employment. This is only evidence that the inexorable law of supply and demand works in all phases of employment relations.

Indications at the present time are that there is just such an economic lever tending to force men into the ranks of craftsmanship. One authority writes that "the worker with a rough neck and a strong back seems sure of employment at lucrative wages through the entire winter, but the 'white collar' men are facing a situation which is growing increasingly serious."

Another jolt for "the white collar job" is seen in the announcement from Carnegie Institute of Technology, in Pittsburgh, that, of the 1200 night students enrolled for the present year in the College of Industries, fifty per cent. have signed to take course in the building trades. This division of students is viewed with unusual significance by officials of the Institute as representative of a growing tendency among young men to learn craftsmanship.

Moreover, according to the report, the increased interest in the building construction courses is confined to no one branch of the industry but is reflected in each department offering building courses. In some of the departments, the number of students enrolled for the present year is 200 to 300 per cent. larger than of the previous year.

The reason for the heavy enrollment this year is attributed by Carnegie Tech authorities to the high wage scales at present in force in most branches of work. Another reason, somewhat indirectly responsible but nevertheless noticeable, is due to the growing interest that labor unions are showing in educational facilities for their apprentices. A striking example of this attitude by the unions was revealed in the recent action of the Pittsburgh union of the International Wood-wire and Sheet Metal Lathers Union which, on its own initiative, has effected a working agreement with Carnegie Tech to train apprentices of this trade. As a result of this agreement, 15 apprentices attached to the local sheet metal lathers union have enrolled at the Institute and are compelled by the union to attend a special night course three nights a week for the next two years.

If this report indicates anything, it at least shows that the opportunities of labor are being more appreciated than for some time past. To contractors it brings a message of hope that the supply of building mechanics will soon be adequate to meet requirements and so establish construction once more on a reasonable footing.

To Prepare Standard Specifications for Structural Steel Buildings

A meeting of the main committee of the Canadian Engineering Standards Association was held in Ottawa on November 5th, under the chairmanship of Mr. H. H. Vaughan. After the transaction of the formal business in connection with the approval of membership of various newly formed working committees, the secretary's report for the past six months was considered and discussed.

The committee unanimously approved of the formation of a sub-committee to prepare specifications for steel structures for buildings, the members of which are being nominated by the Engineering Institute of Canada, the Royal Architectural Institute of Canada, the steel fabricating companies, and other bodies interested. It will be the duty of this sub-committee to prepare specifications similar in scope to the C.E.S.A. specifications for railway and highway bridges, but dealing with steel structures for buildings, and it is hoped that such specifications, if agreed upon by all concerned, may eventually be adopted by public and municipal bodies engaged in the formation of building codes in Canada. Arrangements are being made to provide for this sub-committee as full information as possible concerning the activities of the bodies now engaged in similar work in the United States.

How is Petroleum Asphalt Made and Handled?

A Description of the Process of Manufacture and the Commercial Tests Used in Marketing It

By O. C. Stein

Petroleum asphalt has as its base crude Mexican petroleum. The crude oil is boiled in stills or retorts, the first process bringing the light oils to the surface, after which the same process is applied a second time to remove the heavy oils; what remains is asphalt. The gradual boiling, with the increasing heat application, tends to harden or solidify the asphalt, so that the greater temperature, the harder the asphalt.

Asphalt is sold on specifications providing for certain penetrations, which are determined by a scientific method known as the "penetration test." It is apparent, therefore, that no asphalt is produced until the orders are in hand, and then it is produced in accordance with the specifications as shown in the orders. For example, a road contractor having a contract for the paving of a stretch of road which must accommodate heavy travel will place an order calling for, say, 40-50 penetration, and the asphalt is then manufactured according to these specifications.

From this it is apparent that very little asphalt is stored after being manufactured.

How the "Penetration Test" Works

It may not be amiss here to endeavor to explain the so-called "penetration test." This test is made in the laboratories of the refineries by highly qualified and competent chemists with a scientific instrument which consists of a testing needle, an iron weight weighing 110 grams and a 3 ounce tin container. A sample of asphalt is placed in the 3 ounce container and heated to a temperature of 77 degrees. The needle is then placed by the use of this instrument on the surface of this sample; the 110 gram weight then forces the needle to penetrate the asphalt for five seconds, and the distance this needle penetrates the sample fixes the solidity of the asphalt. For instance, on 40 penetration asphalt this needle would penetrate the sample 40/100 centimeter, or .15748 inch; under 225 penetration specifications this needle would penetrate 225/100 centimeter, or in other words .885825 inch. The penetration test is a known one for fixing the specifications in connection with the sales of asphalt and is recognized and approved by the American Society for Testing Materials.

Another method occasionally employed to determine the solidity of asphalt is the ring and ball test. A disk of bitumen (asphalt) held by a metal ring of prescribed dimensions is suspended in water or glycerine and a steel ball of prescribed weight superimposed. Through the uniform application of heat this specimen begins to melt (or more properly soften) and when it has fallen one inch the thermometer indication is taken as the melting, or softening, point.

All asphalts, of course, are not used in road construction. A considerable volume used for roof coat-

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The Week's Developments in a Nutshell

So far from any additional signs of depression, there are many evidences during the past week that construction will be increasingly active. For example, there is the announcement of Sir Adam Beck that he will recommend the immediate erection of a steam electric generating plant to cost eight or ten million dollars; the conference on Toronto viaduct brings some twenty-five million dollars worth of work a step nearer; work has begun on the five million dollar plant of Dominion Alloy Steel Co., Sarnia; another hydro power plant is projected for the Montreal Tramways and preparations are being made by the Dominion Government to begin work on a million dollar elevator in Edmonton; another encouraging factor is the increase in the estimate in the Canadian wheat yield to 500,000,000 bushels. The announcement of a British election is having a rather unsettling influence on account of Premier Baldwin's recent preferential announcements. It is generally anticipated, however, that he will be returned to power.

The demand for both cement and steel has fallen off but this may be considered as merely seasonal. There are no price changes. The situation is summed up by the Canadian Bankers' Association as follows: "There is no prospect of a boom either in the United States or in Canada, but **there is every prospect of continuous improvement in the business situation.**"

ing, known as roofing flux, is of a penetration or test degree from 111 to 225, depending on specifications.

Asphalt is Kept Warm in Storage

With orders in hand the production begins according to specifications, the product being run into storage tanks of 60,000 to 100,000 gallons capacity, each penetration or grade being placed in a separate storage tank, where it remains just long enough to be tested and analyzed. In the meantime the asphalt in the storage tanks is kept heated by application of steam through coils connected with the storage tanks, the temperature ranging from 250 to 300 degrees Fahrenheit, depending upon weather conditions. During the winter it is, of course, necessary to apply the maximum steam allowance. After proper sampling and analyzing, the shipments are loaded, mostly in tank cars, being pumped by powerful pumps from the storage tanks to the tank cars; consequently, the asphalt when loaded in the tank cars is in a heated state and of the same temperature as prevailed when the asphalt was in the storage tank. Tanks are loaded to the full shell capacity, rarely being loaded in the dome.

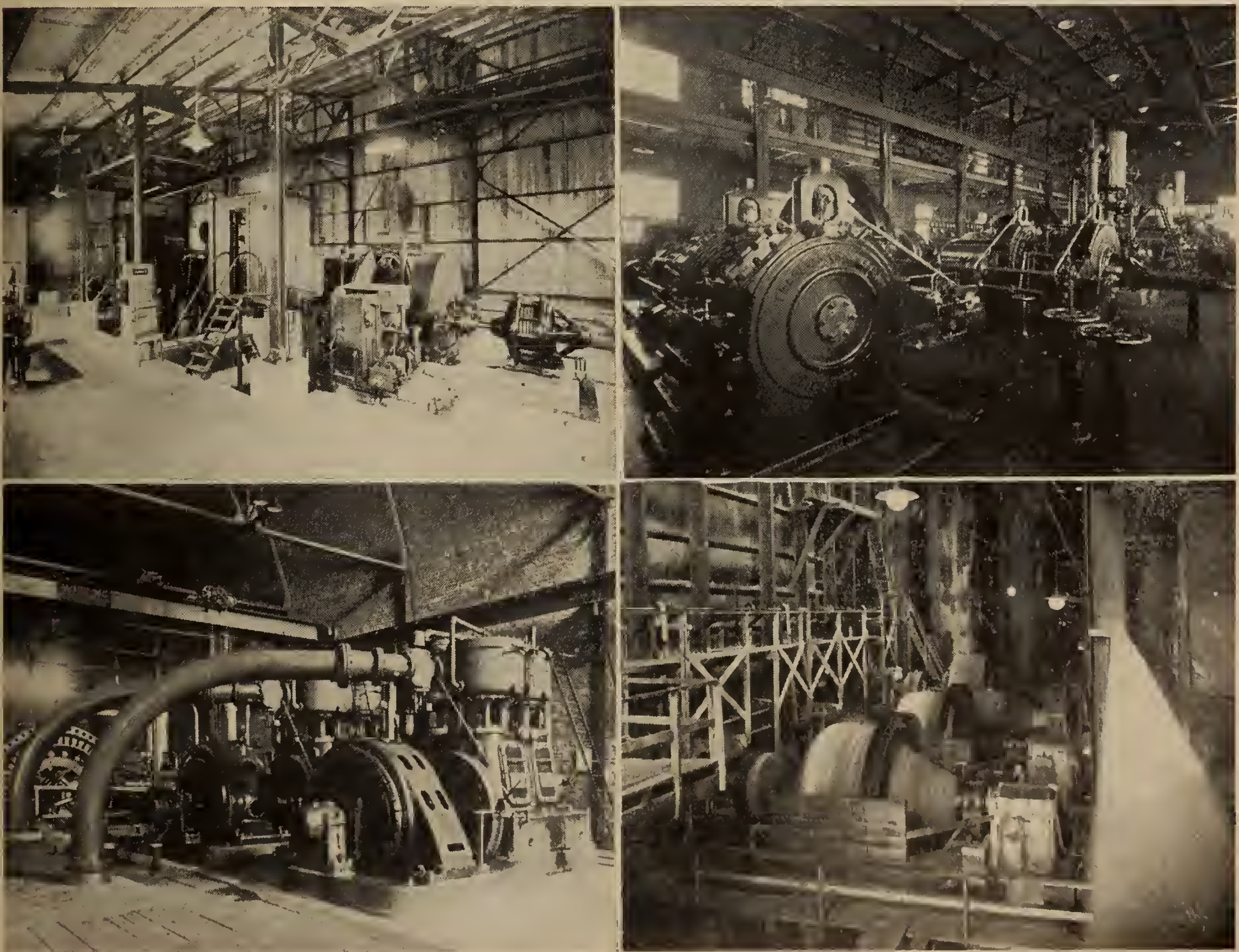
The average capacity of tanks in the asphalt service is 10,000 gallons. These tank cars are equipped with heater coils, so that steam may be applied at the destination to soften or liquify the contents and thereby permit an easy flow.

Asphalt when loaded in a heated condition contains certain air pockets which disappear with contraction. As a result almost immediately after loading, a shrinkage or lessening of the volume of asphalt is perceptible. With an outside natural heat rays temperature of about 120 degrees, asphalt will run freely from tank cars ninety-six hours after loading, so that during the summer months asphalt flows freely from tanks ninety-six hours after loading, while during the winter the free-flowing period is reduced to forty-eight.

From this it will be seen that when asphalt is in transit five days or more it is almost impossible to obtain an easy flow in unloading; hence we note the equipment of the tank cars with heater coils, to which steam is applied at the destination, this method again softening the contents and thereby permitting the easy flow necessary to unload the car.

Most asphalt shipments are loaded in tank cars, although some shipments of the very heavy paving or solid asphalts are made in steel drums approximating 380 pounds a drum, and this package in some instances is used for asphalt in a heated or liquified condition.

Gold Mines of Northern Ontario Large Users of Electrical Equipment



Upper left, the Dome hoist; upper right, compressor room in Hollinger; lower left, vertical compressors in Dome; lower right, ball mills in Dome

For the Building Supply Dealer

How Much Does Your Motor Truck Delivery Cost?

A Standard System for Recording the Factors Entering into the Cost of Operating Motor Equipment

By J. E. Pickens, Transportation Engineer, Selden Truck Corporation, Rochester, N.Y.

We can cite many instances of economical delivery of lumber by our trucks—it will be easy to find cases of horse delivery just as economical—but in most cases when we get into the facts we find most of them missing. The owner may know the cost of gas and oil or perhaps repairs, but his accounts do not show depreciation, garage, interest on investment and other important items. The horse owner knows what oats cost him and the hay and straw, but no stable charges, interest, depreciation on animal, wagon and harness, no veterinary costs, nor many other items are listed.

Delivery Cost Facts Are Essential

Before we can truly talk delivery costs, before we can truly compare horse and truck, or one make of truck with another, we must have facts. We must have facts because it is only with a true, substantial analysis of delivery costs that we can stop possible leaks—and leakages even in the delivery end are easily possible for the best company to have.

To get these facts you must use a definite system—one that will be simple and easy to operate and yet one that will cover the ground—like the women's skirt, there must be enough to cover the subject but short enough to be interesting. This system must be good for all sorts of trucks, gas and electric and for all conditions in retail and wholesale lumber delivery.

In this article I want principally to discuss just such a system—one that was arranged by the truck owners' conference, at a series of meetings. It has been adopted by practically all of the big companies operating large fleets of trucks, and by the N.A.C.C. It is the National Standard Truck Cost System.

Standard System is Simple But Effective

Regardless of the truck you use, or the exact nature of the work, you should know certain facts about it if you are to secure the maximum efficiency at minimum cost. Let us look into the national standard system and see if it gives us all necessary information in a simple form, and also if it will pay us to use it.

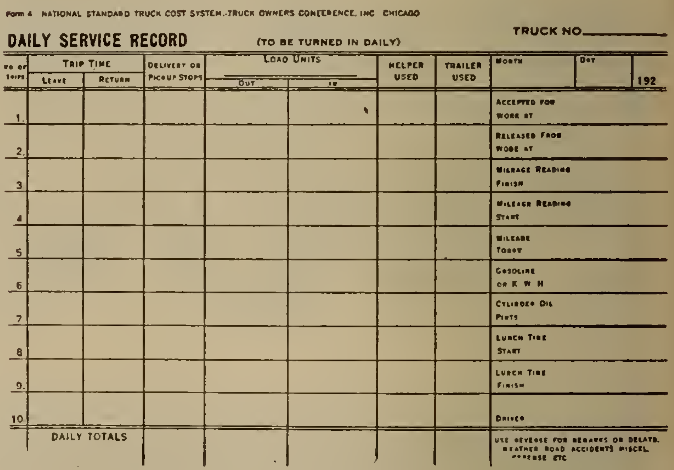
Of course there must be some connection between the system and the truck driver. He is no bookkeeper but his records are essential and very easy to get by form No. 4, the driver's daily report. This can be had in card form, or in pads of paper, both very easy to handle as they are pocket size. Note that all necessary information is given—trip time, deliveries, load units, out and in; helper and trailer facts; mileage for the day; gas and oil used; time starting and quitting and out for lunch. It is not necessary to use all these items, of course; for instance you may not keep the time, but this would be a good thing to know.

The driver turns this slip in every day and his part of the cost system is finished. In the office you have a book like this form No. 2. It fits your filing system and is already marked for identification. One book is good for one truck one year.

The Daily Record and Monthly Recap Sheets

Inside are different forms. Form No. 1 is a daily record sheet. Here the items on the driver's report are listed. Notice the sheet has 31 rules, one for each day—each sheet is good for one month and the book contains 12 of form No. 1. Read the items across the page—from the driver's record you get: date, number of trips, deliveries, total units out and in, time, gasoline, oil. The other items must be filled in from office records—all cost items—driver, helper, repairs, gas and oil.

At the end of the month you have a complete record of your haulage on form 1. Then turn to form No. 2. Just one sheet of this form in the book, but it is divided into 12 columns, one for each month. Notice items on the left side—from A to N is just the total figures from form 1. Then from N to R you make up your daily averages from the above figures. From S to V you average your cost items per day, mile, unit and unit mile.



Form 4 NATIONAL STANDARD TRUCK COST SYSTEM.-TRUCK OWNERS CONFERENCE, INC CHICAGO

TRUCK NO.______

DAILY SERVICE RECORD (TO BE TURNED IN DAILY)

No. of Trips	Trip Time		Delivery or Pickup Stops	Load Units		Helper Used	Trailer Used	Month	Day	192
	Leave	Return		Out	In					
1.								Accepted for Work at		
2.								Released From Work at		
3								Mileage Reading Finish		
4								Mileage Reading Start		
5								Mileage Today		
6								Gasoline or K W H		
7								Cylinder Oil Pints		
8								Lunch Time Start		
9.								Lunch Time Finish		
10								Driver		
	Daily Totals							Use reverse for remarks or delays, weather road accidents miscel. expense etc		

Form 4

You are now getting your facts in a form where concrete analysis is possible and also profitable. If every dealer kept his costs on this record, he would have a mass of valuable data on delivery costs. Whereas now he has practically nothing of a definite nature on which to base comparisons of truck and horse, or truck and truck. You should know exactly how different capacities and body types influence your delivery costs. But more about this system.

Form 3 consists of forms 3A, 3B and 3C. Here we list your investments on 3A. Next your fixed

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*Based on an address before the Northeastern Retail Lumbermen's Association.

Form 1 National Standard Truck Cost System Truck Owners Conference Inc., Chicago.

DAILY RECORD, MONTH OF ____________, HOURS IN WORKING DAY ______ FROM ____________ TO ____________ TRUCK NO. ______

OPERATING DATA																COST DATA (Posted to Form 3c)										
Date	Weather	Temperature	Number of Trips	Delivery or Pick-up Stops	Total Units ______ (See O)		Miles	Time in Hours and Minutes								Gasoline or Current		Cylinder Oil		Driver Cost	Helper Cost	Cost of Repairs				[illegible] Vehicle Rental
								Available but not Used		Loading		Running Includ. Stops		Laid up for Repairs		Gals or K.W.H.	Cost	Pints	Cost			Ordinary			Accident	
					Out	In		HRS	MIN	HRS	MIN	HRS	MIN	HRS	MIN							Material Chassis	Labor Chassis	Labor and Material Body	Body and Chassis	
1																										
2																										
3																										
4																										
5																										
6																										
7																										
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26																										
27																										
28																										
29																										
30																										
31																										
Total																										

Form 1

Form 2 National Standard Truck Cost System Truck Owners Conference, Inc., Chicago.

MONTHLY ANALYSIS OF OPERATION __________ CAPACITY __________ MAKE __________ *FISCAL YEAR __________ TO __________ TRUCK NO. ______

	**Insert First Month of Fiscal Year in Heading of First Column etc													6 Mos Total or Average	12 Mos Total or Average
A.	Number of days operated														
B.	Number of round trips														
C.	Delivery or pick up stops														
D.	Total units ______ out														
E.	Total units ______ in														
F	Miles traveled														
G.	Gallons of gasoline or K. W. H. current														
H	Pints of cylinder oil														
I.	Hours available but not used														
J	Hours loading														
K	Hours running including stops														
L	Hours laid up for repairs														
M.	Hours with helper														
N.	Trailer data														
	AVERAGES FROM ABOVE														
B 1	Round trips per day														
C 1	Delivery or pick up stops per day														
D 1	Total units ______ per day														
E 1	Average units ______ per trip														
E 2	Unit ______ miles per day														
F 1	Miles traveled per day														
F 2	Average round trip distance														
G 1	Miles per gal. of gasoline or per K. W. H.														
H 1	Miles per gallon of cylinder oil														
J 1	Average hours loading per day														
J 2	Average minutes loading per trip														
K 1	Average hours running including stops per day														
K 2	Average hours in service per day														
P	Average speed in miles per hour														
Q	Estimated running time per mile														
R.	Estimated time per customers stop (in min)														
S.	Cost per day operated														
T	Cost per mile														
U.	Cost per unit ______														
V	Cost per unit mile														

Form 2

charges under 3B and lastly analysis of cost under 3C. There are other forms for the records, but we will not touch on them.

Perhaps this brief showing and explanation leaves the impression that the system is rather intricate, but it isn't. In brief what we want to know is given in form No. 6 "What truck cost per day"—"What truck did"—and "What facts did I learn from the information collected."

FORM NO 6

What Truck Cost (Per Day)

Interest	$ .60
Taxes	.20
License	.03
Driver's Wages	3.00
Garage Rent	1.00
Insurance	.50
Depreciation	2.00
Tires	1.50
Gasoline	2.50
Oil	.15
Garage Service	.02
Maintenance	.75
Total Cost	$12.25

What Truck Did

Truck covered a distance of ....40 miles
Truck delivered a total of ....400 packages
Truck made a total of ....220 stops
Truck made during the day ....6 round trips

Facts Which I Learned From This Information

If truck covers 40 miles, it costs me 30 cents per mile.

If truck costs $12.25 a day, and delivers 400 packages, it costs me 3 cents to deliver each package.

If truck makes 220 stops for deliveries, it costs me 5 1-2 cents per stop.

If truck makes 6 trips, each trip costs me, on the average, the sum of $2.04.

The following tables give actual costs of truck operations in typical cases:

FORM NO. 7

Analysis of Truck Operation and Costs

Owner—
Hennepin Lumber Co.
Address—
Minneapolis, Minn.

Business—Retail
Lumber Delivery
Truck Capacity—
3½ tons (A)

Operation Records

A—Total Period

1. Period covered	.10 Mos.
2. Days operated ..	250
3. Days out for repairs	......
4. Total Round Trips	......
5. Deliveries—Pickups	......
6. Loads—Out	......
7. Loads—In	......
8. Total Loads	......
9. Miles Traveled ..	12,050
10. Gasoline—Gals. used	2,191
11. Cyl. Oil—Gals. used	640

B—Daily Averages

12. Round Trips	......
13. Deliveries—Pickups	......
14. Loads—Out	......
15. Loads—In	
16. Total Loads	......
17. Miles Traveled ..	48.2
18. Miles per Round Trip	......
19. Load per Trip ..	......
20. Unit Miles	......
21. Miles per Gal. Gas.	5.5
22. Miles per Gal. Oil	18.8

Cost Records

C—Investments

23. Chassis—etc. complete	$3800.00
24. Body	......
25. Cab	......
26. Painting	......
27. Special Equipment	
28.	......
29.	......
30. Total Investment	3800.00
31. Tire Value	386.70
32. Total less Tires—to be Depreciated	3413.30

D—Fixed Charges—Yearly

33. Interest on Total Inv. (5 yrs.) @ 6% .	$ 136.80
34. Taxes and Licenses	3.15
35. Insurance	162.00
36. Garage Expenses	120.00
37. Total per Annum	$ 421.95
38. Total per Month (per Day $1.40)	35.16
39. Total for Period—10 Mos.	351.60

E—Variable Charges—Period

40. Fuel at 27c. Gal.	$ 591.57
41. Clf. Oil at 60c. Gal.	48.00
42. Tires—12050 Miles $386.70—10,000 Miles Life	466.34
43. Depreciation—12050 Miles .... $3413.30—60,000 Miles Life	684.44
44. Cyl. Oil at 60c. Gal.	48.00
(Est.)	240.00
45. Total Variable Charges ((Per Day $8.12)	2030.35
46. Driver's Wages—(per day $5.20)	1300.00
47. Total Fixed Charges	351.60
48. Total Operation Costs	3681.95

F—Daily Costs

49. Cost per Day Operated	$ 14.727
50. Cost per Mile Traveled	.305
51. Cost per— Hauled	
52. Cost per— Mile ..	
53. Repair Cost per mile—Est.	.019
54. Repair Cost per Mile—Actual ...	.000

FORM NO. 8

Analysis of Truck Operation and Costs

Owner—The
Brislin Co.
Address—
Brooklyn, N. Y.

Business—Hauling
Bldg. Supplies
Truck Unit—
No. 90

Operation Records

A—Total Period

1. Period covered .	1 Yr.
2. Days operated ..	300
3. Days out for repairs	
4. Total Round Trips	1200
5. Deliveries—Pickups	
6. Loads—Out—Tons	7200
7. Loads—In	
8. Total Loads—Tons	7200
9. Miles Traveled ..	22,500
10. Gasoline—Gals. used	3,461
11. Cyl. Oil—Gals. used	150

B—Daily Averages

12. Round Trips	4
13. Deliveries—Pickups	......
14. Loads—Out—Tons	24
15. Loads—In	......
16. TotalLoads—Tons	.24
17. Miles Traveled ..	75
18. Miles per Round Trip	18.7
19. Load per Trip —Tons	6
20. Ton-Miles (6 Tons Moved 37.5 M.)..	225
21. Miles per Gal. Gas.	6.5
22. Miles per Gal. Oil.	150

Cost Records

C—Investments

23. Chassis—	$5000.00
24. Body	1000.00
25. Cab	......
26. Painting	......
27. Special Equipment	......
28.	......
29.	......
30. Total Investment	$6000.00
31. Tire Value	357.10
32. Total less Tires—to be Depreciated..	$5642.90

D—Fixed Charges—Yearly

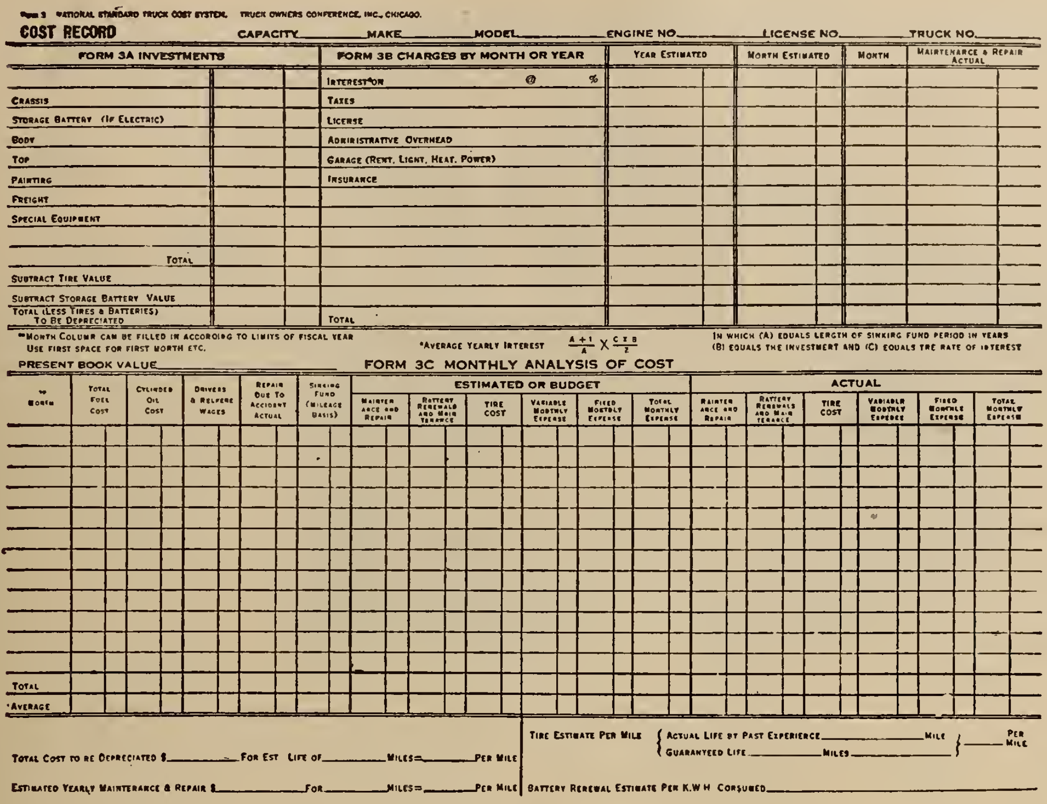
33. Interest on Total Inv. (4 yrs. at 6%)	$ 225.00
34. Taxes and Licenses	50.00
35. Insurance	385.00
36. Garage Expenses.	183.33
37. Total per Annum	843.33
38. Total per Month (Per Day $2.81) .	70.27
39. Total for Period—1 Yr.	843.33

E—Variable Charges—Period

40. Fuel at 27 cts. Gal.	$ 934.47
41. Cyl. Oil at 68 cts. Gal.	102.00
42. Tires—22,500 Miles $367.10—15,000 Miles Life	535.80
43. Depreciation—22,500 Miles .... $5642.90—90,000 Miles Life	1410.75
44. Maintenance and Repairs (Est.)	400.00
45. Total Variable Charges (Per Day $11.27)	3383.22
46. Driver's Wages (Per Day $6.07)	1820.00
47. Total Fixed Charges	843.33
48. Total Operation Costs	6046.55

F—Daily Costs

49. Cost per Day Operated	$ 20.155
50. Cost per Mile Traveled	.268
51. Cost per Ton Hauled	.839
52. Cost per Ton—Mile	.089
53. Repair Cost per Mile—Est.	.017
54. Repair Cost per Mile—Actual .. For 38.470 Miles —20 Mos.	.005



Form 3 NATIONAL STANDARD TRUCK COST SYSTEM. TRUCK OWNERS CONFERENCE, INC., CHICAGO.

COST RECORD CAPACITY____ MAKE____ MODEL____ ENGINE NO.____ LICENSE NO.____ TRUCK NO.____

FORM 3A INVESTMENTS			FORM 3B CHARGES BY MONTH OR YEAR	YEAR ESTIMATED		MONTH ESTIMATED		MONTH	MAINTENANCE & REPAIR ACTUAL	
			INTEREST*ON @ %							
CHASSIS			TAXES							
STORAGE BATTERY (IF ELECTRIC)			LICENSE							
BODY			ADMINISTRATIVE OVERHEAD							
TOP			GARAGE (RENT, LIGHT, HEAT, POWER)							
PAINTING			INSURANCE							
FREIGHT										
SPECIAL EQUIPMENT										
TOTAL										
SUBTRACT TIRE VALUE										
SUBTRACT STORAGE BATTERY VALUE										
TOTAL (LESS TIRES & BATTERIES) TO BE DEPRECIATED			TOTAL							

**MONTH COLUMN CAN BE FILLED IN ACCORDING TO LIMITS OF FISCAL YEAR
USE FIRST SPACE FOR FIRST MONTH ETC.

*AVERAGE YEARLY INTEREST $\frac{A+1}{A} \times \frac{C \times B}{2}$

IN WHICH (A) EQUALS LENGTH OF SINKING FUND PERIOD IN YEARS
(B) EQUALS THE INVESTMENT AND (C) EQUALS THE RATE OF INTEREST

PRESENT BOOK VALUE____

FORM 3C MONTHLY ANALYSIS OF COST

** MONTH	TOTAL FUEL COST	CYLINDER OIL COST	DRIVERS & HELPERS WAGES	REPAIR DUE TO ACCIDENT ACTUAL	SINKING FUND (MILEAGE BASIS)	ESTIMATED OR BUDGET						ACTUAL					
						MAINTENANCE AND REPAIR	BATTERY RENEWALS AND MAINTENANCE	TIRE COST	VARIABLE MONTHLY EXPENSE	FIXED MONTHLY EXPENSE	TOTAL MONTHLY EXPENSE	MAINTENANCE AND REPAIR	BATTERY RENEWALS AND MAINTENANCE	TIRE COST	VARIABLE MONTHLY EXPENSE	FIXED MONTHLY EXPENSE	TOTAL MONTHLY EXPENSE
TOTAL																	
*AVERAGE																	

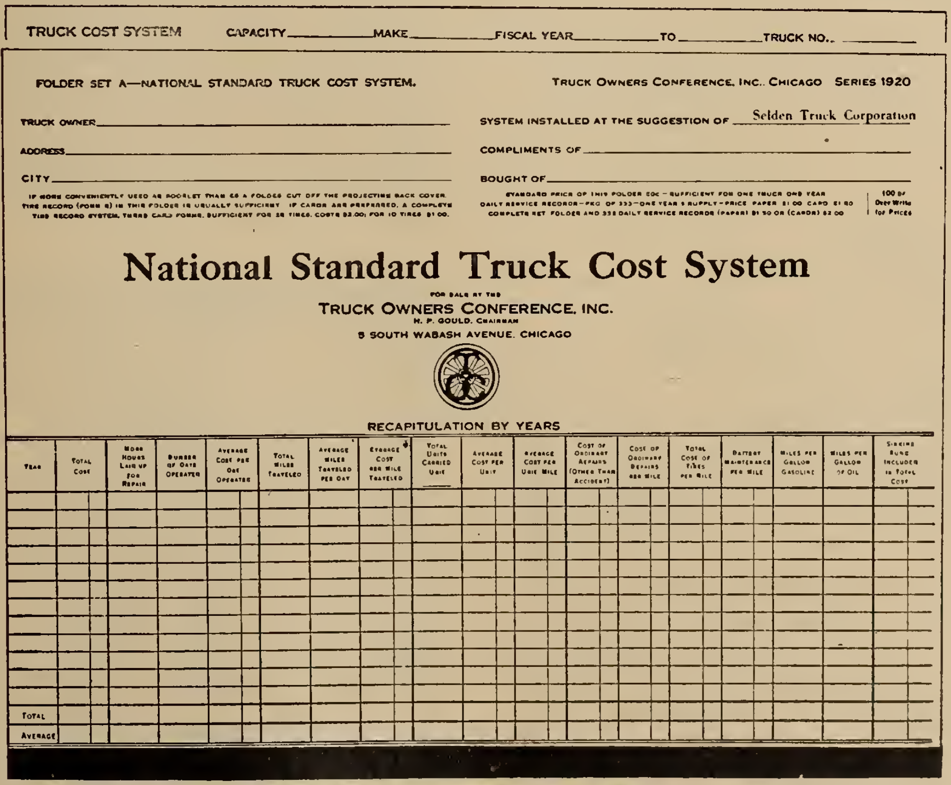
TOTAL COST TO BE DEPRECIATED $____ FOR EST LIFE OF____ MILES=____ PER MILE

ESTIMATED YEARLY MAINTENANCE & REPAIR $____ FOR____ MILES=____ PER MILE

TIRE ESTIMATE PER MILE { ACTUAL LIFE BY PAST EXPERIENCE____ MILE / GUARANTEED LIFE____ MILES____ } ____ PER MILE

BATTERY RENEWAL ESTIMATE PER K.W.H. CONSUMED____

Form 3



TRUCK COST SYSTEM CAPACITY____ MAKE____ FISCAL YEAR____ TO____ TRUCK NO.____

FOLDER SET A—NATIONAL STANDARD TRUCK COST SYSTEM.

TRUCK OWNERS CONFERENCE, INC., CHICAGO SERIES 1920

TRUCK OWNER____

ADDRESS____

CITY____

IF MORE CONVENIENTLY USED AS BOOKLET THAN AS A FOLDER CUT OFF THE PROJECTING BACK COVER. TIRE RECORD (FORM 6) IN THIS FOLDER IS USUALLY SUFFICIENT. IF CARDS ARE PREFERRED, A COMPLETE TIRE RECORD SYSTEM, THREE CARD FORMS, SUFFICIENT FOR 25 TIRES, COSTS $2.00; FOR 10 TIRES $1.00.

SYSTEM INSTALLED AT THE SUGGESTION OF Selden Truck Corporation

COMPLIMENTS OF____

BOUGHT OF____

STANDARD PRICE OF THIS FOLDER 50c — SUFFICIENT FOR ONE TRUCK ONE YEAR
DAILY SERVICE RECORDS—PKG OF 333—ONE YEAR'S SUPPLY—PRICE PAPER $1.00 CARD $1.50
COMPLETE SET FOLDER AND 333 DAILY SERVICE RECORDS (PAPER) $1.50 OR (CARDS) $2.00

100 or Over Write for Prices

National Standard Truck Cost System

FOR SALE BY THE
TRUCK OWNERS CONFERENCE, INC.
H. P. GOULD, CHAIRMAN
5 SOUTH WABASH AVENUE, CHICAGO

RECAPITULATION BY YEARS

YEAR	TOTAL COST	WORK HOURS LAID UP FOR REPAIR	NUMBER OF DAYS OPERATED	AVERAGE COST PER DAY OPERATED	TOTAL MILES TRAVELED	AVERAGE MILES TRAVELED PER DAY	AVERAGE COST PER MILE TRAVELED	TOTAL UNITS CARRIED UNIT	AVERAGE COST PER UNIT	AVERAGE COST PER UNIT MILE	COST OF ORDINARY REPAIRS (OTHER THAN ACCIDENT)	COST OF ORDINARY REPAIRS PER MILE	TOTAL COST OF TIRES PER MILE	BATTERY MAINTENANCE PER MILE	MILES PER GALLON GASOLINE	MILES PER GALLON OF OIL	SINKING FUND INCLUDED IN TOTAL COST
TOTAL																	
AVERAGE																	

Form 5

FORM NO. 9

Analysis of Truck Operation and Costs

Owner—Main Transfer Co.
Address—Brooklyn, N. Y.
Business—Export & Import Trucking
Truck Capacity—1½ tons (A)

Operation Records

A—Total Period

1. Period covered ..	1½ Yrs.
2. Days operated ..	426
3. Days out for Repairs	.....
4. Total Round Trips	1278
5. Deliveries—Pickups	12780
6. Loads—Out—Tons	1917
7. Loads—In	......
8. Total Loads—Tons	1917
9. Miles Traveled ..	10000
10. Gas.—Gals. used	1111
11 Cly. Oil—Gals. used	106½

B—Daily Averages

12. Round Trips	3
13. Deliveries—Pickups	30
14. Loads—Out—Tons	4.5
15. Loads—In	......
16. Total Loads—Tons	4.5
17. Miles Traveled ..	23.5
18. Miles per Round Trip	7.8
19. Loads per Trip —Tons	1.5
20. Ton-Miles	17.55
21. Miles per Gal. Gas.	9
22. Miles per Gal. Oil	94

Cost Records

C—Investments

23. Chassis	$2460.00
24. Body	350.00
25. Cab	......
26. Painting	......
27. Special Equipment	......
28. Two Spare Tires	219.95
29.	......
30. Total Investment	3029.95
31. Tire Value—Pneumatics	439.90
32. Total less Tires—to be Depreciated	2590.05

D—Fixed Charges—Yearly

33. Interest on Total Inv. at 7%	$ 212.10
34. Taxes and licenses	15.00
35. Insurance	265.00
36. Garage Expenses	300.00
37. Total Per Annum	792.10
38. Total per Month (per day $2.78).	66.01
39. Total for Period —1½ Yrs.	1188.15

E—Variable Charges—Period

40. Fuel at 30 cts. Gal.	$ 333.30
41. Cyl. Oil at $1.00 Gal.	106.50
42. Tires—10,000 Miles	439.90
$439.90—10,000 Miles Life	
43. Depreciation—10,000 Mls.	432.00
$2590.05—60,000 Miles Life	
44. Maintenance and Repairs (Est.) ..	150.00
45. Total Variable Charges	1188.15
46. Driver's Wages —Helper	3113.40
47. Total Fixed Charges	1461.70
48. Total Operation Cost	5763.25

F—Daily Costs

49. Cost per Day Operated	$ 13.53
50. Cost per Mile Traveled	57
51. Cost per Ton Hauled	3.00
52. Cost per Ton—Mile	.77
53. Repair Cost per Mile—Est.	.015
54. Repair Cost per Mile—Actual	.000

In a few minutes let us go over the items making up the cost of haulage by truck. In the first place true truck costs are divided into fixed charges, (those remaining the same regardless of the work the truck does) and variable charges (those depending upon the miles traveled).

The Items That Make up True Truck Costs

The fixed charges are made up of interest on the total investment, taxes and license, insurance and garage expenses. These of course are figured annually and then divided over the number of days operated by the truck.

We will discuss just one item in fixed charges and that is interest on investment. Many figure this item merely by multiplying the total investment by the rate of interest. However, this is not quite fair, because each year your depreciation item returns a certain amount of your investment to you. You should consider this in figuring interest and the following simple formula has been devised:

$$\frac{A+1}{A} \times \frac{B \times C}{2}$$

In this formula

A=depreciation life in years.
B=the total investment, and
C=the rate of interest.

Thus—$3000 investment at 6%, 5 years depreciated life.

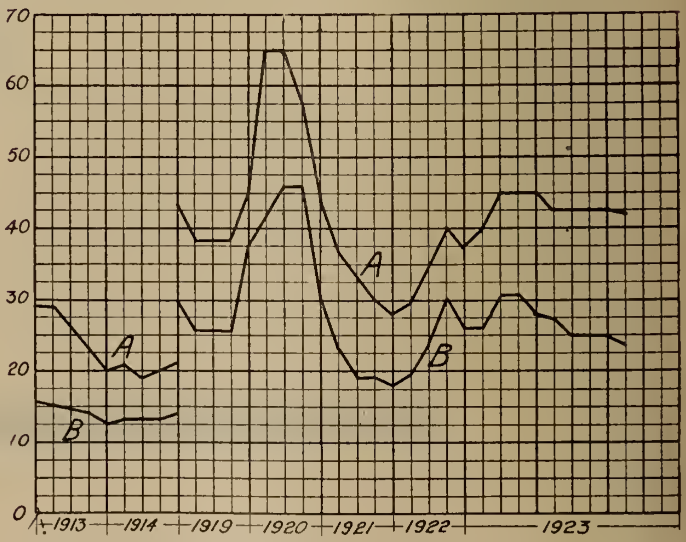
$$\frac{5+1}{5} \times \frac{3000 \times 6}{2} = \$108.00 \quad \text{Interest for 1 year.}$$

Variable charges are made up of fuel, cylinder oil, depreciation and maintenance and all are of course figured on the mileage basis. We need say nothing about the first two items. The third—tires,—is figured merely by dividing the total cost of the tires by the miles life, either using the guarantee or figures from past experience and this gives you the cost per mile. Depreciation should be figured on the total investment, less the cost of the tires and this amount divided by the miles-life given to the truck. If you have considered life of 5 years and your truck makes 15,000 miles a year, your life in miles is 75,000.

Then in order to find the cost per day operated, it is only necessary to multiply your total variable charges per mile, by the number of miles traveled and to this result add the fixed charges per day and the driver's wages.

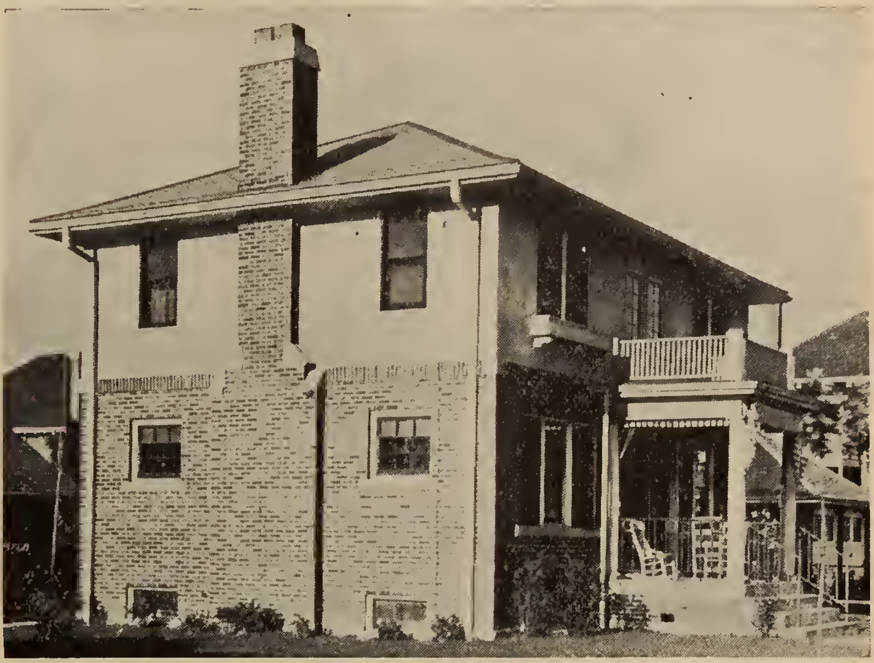
But the essential thing to remember, if you are giving an estimate on the cost of material to be used in the construction of a building you will be very careful to include every item and to know exactly what each piece of material costs you and what it will cost to put it into the building. You should know just as thoroughly what you are putting into your truck each day and just what you are getting out of it. You cannot afford to invest several thousand dollars in truck equipment and not be sure you are getting the most for your money and this most for your money can only be ascertained by records of truck performance on the job.

Iron and Steel Price Variations, 1913-1923



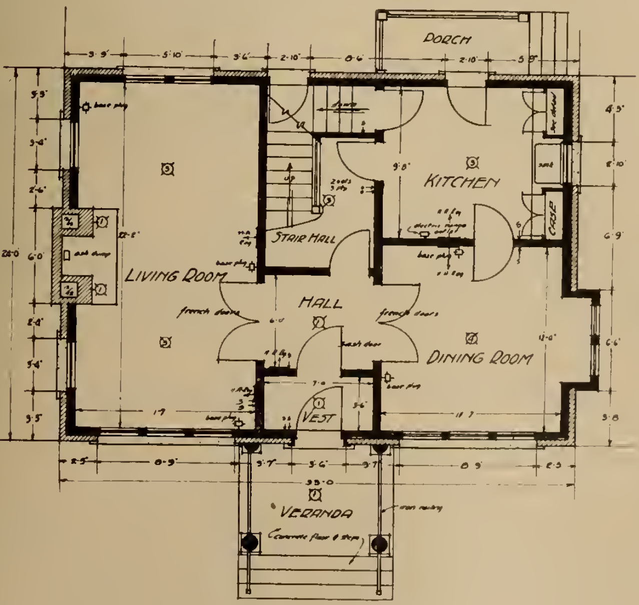
A. Steel Billets, Open Hearth, Pittsburgh; B. Iron, basic

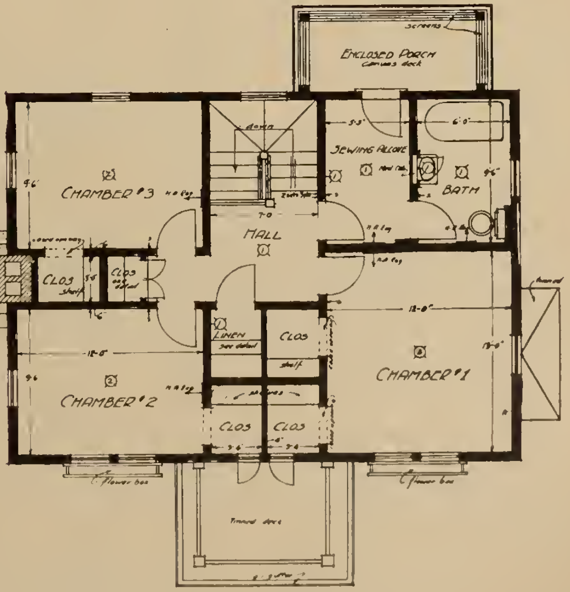
The Contract Record's Weekly House Suggestion No. 89



This fine brick and stucco, square plan residence was designed by Mr. Gilbert J. P. Jacques, architect, of Windsor, Ont., and built in that city for Mr. J. A. Frances. It is a centre hall plan, with large, bright living room occupying the entire left side of the house and dining room and kitchen on the right. The hall is divided into two sections, as seen on the plan, the front section serving as a reception hall, with double French doors on either side to the living room and dining room. The rear half of the hall accommodates the staircase and has an entrance on the kitchen. This is a model plan for this type of residence and incorporates the very desirable feature of economy, every single foot of floor space being utilized to the best possible advantage.

The upstairs layout also suggests careful planning and comprises three roomy bed chambers, sewing room and bedroom, with hall space kept down to the minimum. All bedrooms are well provided with closet space and well lighted with windows on two sides. There is an enclosed porch at the rear available through the sewing room. Flooring and trim throughout the house is of hardwood.





Mainly Constructional

East and West—From Coast to Coast

The Canadian Ornamental Iron Works, at Montreal, has been dissolved.

The rail mill at Sydney, N. S., reports indications are that orders now on hand and pending will mean full time operation up to June, 1924.

The Ottawa River Power Company, Limited, recently awarded a contract to Fraser, Brace & Company, of Montreal, for the installation of a water power at Bryson, on the Ottawa River, 50 miles from the city. The preliminary tests have shown that this site is capable of a 60,000 horse power development. The first contract awarded to contractors calls for an installation which will result in 25,000 horse power being obtained. According to the plans, the plant is to be complete with the first unit installed by December 1, 1924.

The new court house at Haileybury, Ont., the largest of the town's reconstructed buildings, will be completely walled in and roofed before winter, states a recent report. The court house will cost about $250,000 when completed and will be one of Northern Ontario's finest public buildings.

Improvements to cost $175,000 will be commenced immediately at the approaches to the lower steel arch bridge at Niagara Falls. Most of the work will be at the Canadian end. What will be virtually a new street will be opened, making the approach to the bridge 62 feet, instead of just about half that width. New brick building to accommodate bridge officials and the customs and immigration staffs will be erected.

The uncompleted Y.M.C.A. Building on Georgia St, Vancouver, will be completed and equipped as a modern apartment building at a total cost of $300,000. Work has already been commenced on this seven-storey structure and it will comprise, when completed, 123 suites. The building will be known as the St. Julien Apartments.

There is a possibility of a $1,000,000 hotel being erected by the C.P.R. at Fort William, states a recent news item. The report goes on to say that the company are considering a site in close proximity to the Union Depot.

The Hamilton chapter of the Ontario Architect's Association was recently addressed by Judge Colin G. Snider, at a banquet held in the Royal Connaught Hotel, Hamilton. Judge Snider spoke on "Law," dealing particularly with the law of contracts.

The City Improvement League at Montreal submitted a number of petitions to the City Council at a recent meeting, favoring the promulgation of the building code, such as had already been prepared under the control of the municipal authorities. The Council was accordingly informed that the Quebec Architects Association, the Builders' Exchange, the Canadian Fire Underwriters' Association, the Engineering Institute of Canada, the Chambre de Commerce, the Board of Trade, the Montreal Building Trades Council and other organizations supported the request made in the petitions.

The formation of a committee to draft standard specifications for steel structures for buildings was approved at the tenth meeting of the main committee of the Canadian Engineering Standards Association, held at Ottawa recently. This work is to be carried on in co-operation with a similar committee in the United States. In the preliminary stages of this work assistance will be given by the Engineering Institute of Canada, the Royal Architectural Institute of Canada, leading firms engaged in the fabrication of steel structures, and well-known engineers in this branch of work.

Next year will be a busy year in road building in the province of Alberta, according to a recent statement of C. A. Davidson, chief engineer, who announces that from $50,000 to $70,000 will be spent on the Calgary-Banff highway and about $1,000,000 on four other highways in the province.

Personal

Mr. W. H. Kenny, president of the Sarnia Finance Corporation and the T. Kenny Company of that city, was recently elected to the Board of Directors of the Dominion Alloy Steel Corporation, Sarnia, Ont.

On the occasion of his retirement as secretary of the Builders Exchange at Chatham, Ont., Mr. J. G. Blakely was presented with a travelling bag by the members of the Exchange, in appreciation of his services. Mr. Blakely and family will make a five months trip to the south.

Mr. A. W. Campbell, Chief Commissioner of Highways, attended the Public Works, Roads and Transport Congress and Exhibition at London, as a representative of the Government of Canada. The congress and exhibition was held in the Royal Agricultural Hall, November 12 to 19, under the chairmanship of Sir Henry P. Maybury, Director-General of Roads, Ministry of Transport. The agenda of the congress covered a large number of papers and conferences on road building, sanitation and kindred subjects.

Mr. Walter Herd has been appointed chief mining engineer of the British Empire Steel Corporation, of Sydney, N. S., with jurisdiction over all mines and mining property of the constituent and subsidiary companies, according to a recent announcement.

Professor H. E. T. Haultain, head of the department of mining and metallurgy in the faculty of science and engineering, University of Toronto, left recently for a lecture tour of the larger cities of the northeastern states, at the request of the American Institute of Mining and Metallurgical Engineers.

Obituary

Mr. George E. Tanguay, prominent architect of Quebec city, died at his home there recently, following a very brief illness. Deceased was widely known in architectural circles and did considerable work for the provincial government. He also designed many of Quebec's fine business buildings and church structures.

Mr. Charles Albert Bigger, assistant director of the Geodetic Survey of Canada, died suddenly at his office in Ottawa a few days ago. Mr. Bigger was 70 years old and was born near Paris, Ont. Early in his career he made engineering his profession and practised for many years in Ontario, the Northwest and British Columbia. He entered the employ of the Dominion Government in 1901 and conducted surveys of the international boundary in southeastern Alaska and in southern Quebec. When the Geodetic Survey of Canada was commenced in 1905, under the late Dr. W. F. King, Mr. Bigger was chosen and appointed as the assistant superintendent.

Mr. George E. Mills, well-known contractor, of Hamilton, died a few days ago at his home, 614 King St. East. His death followed a few weeks' illness. The late Mr. Mills was born in England in 1849 and came to Hamilton 22 years ago. He constructed some of this city's largest buildings, including the Wright House, Wood Vallance warehouse, Central Presbyterian Church, Sawyer-Massey plant, Duke of York and Herkimer apartments. He was president of the Gore Realty Co. and a member of the Chamber of Commerce.

CONSTRUCTIONAL ACTIVITY

Period of November 14 to November 20, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Goderich, Ont.

The town council contemplate laying storm sewers in Victoria St. S. M. Johnston, Stratford, Ont., is the engineer.

Montreal, Que.

Tenders are being received by the city council, through the Executive Committee, till November 26th, for the laying of sewers on Notre Dame de Grace Ave. From Wilson Ave. to Hampton Ave., from Madison Ave. to 101 ft. west of Beaconsfield and Kensington from south side Sherbrooke to north side Notre Dame de Grace Ave. Plans and specifications with department.

Neustadt, Ont.

The installation of a waterworks and fire protection system is contempleted by the town council.

North Grimsby, Ont.

Township of North Grimsby contemplate laying watermain on various streets at a cost of $17,000.

St. Catharines, Ont.

The laying of sewers on Vine, Westchester and Thorold Rd. is contemplated by the city council. B. L. Lamson is the engineer.

CONTRACTS AWARDED

Toronto, Ont.

Contracts for asphalt pavement on Strickland Place has been awarded by the city of Toronto to Constructing & Paving Co., at $3,441.

Timmins, Ont.

The contract for watermains and sanitary sewers has been awarded by the town council to Leo. Mascioli.

Railroads, Bridges and Wharves

Quebec Ouest, Que.

The town council is receiving tenders till December 1, through the secretary, J. P. Galibois, for the erection of iron bridge 245 ft. long, 25 ft. wide, on Marie de L'Incarnation St. Engineer is Ivan E. Valle, Parliament Bldgs., Quebec

Tenders are being received till December 1 by the town council, through the secretary, J. P. Galibois, for the erection of iron bridge "Scott," 176 ft. long. Ivan E. Vallee is the engineer in charge of this work.

Sydney, N. S.

The city council contemplate the erection of a bridge to cost $17,000. Ronald M. McKinnon, is the engineer.

CONTRACTS AWARDED

St. Pierre Les Becquets, Que.

Contract for reconstruction of wharf here has been awarded to Onesime Poliquin, Portneuf, Que., at $14,053.

Public Buildings, Churches and Schools

Goderich, Ont.

S. B. Coon & Son, 4 St. Thomas St., Toronto, are preparing plans for remodelling college here.

The town council contemplate the erection of a market building here.

Lakeside, Ont.

The erection of a public hall on Brock St., to cost $5,000 is contemplated by John Simkins, the owner.

London, Ont.

Tenders are being received by the Board of Education, through the secretary, W. A. Tanner, for the construction of a school to cost $175,000 on Empress Ave. No closing date set. Plans and specifications with secretary. Prices wanted on all equipment. L. E. Carrothers is the architect.

Montreal, Que.

Parish of Ste. Cecile Montreal, 1171 De Castle neau St., contemplate building $250,000 church and sacristy on De Castelneau St. Work will likely go ahead in the spring.

Point Grey, B. C.

Twizell & Twizell, Vancouver, B. C., are preparing plans of $90,000 school for Point Grey School Board. Tenders will be called early in January.

Toronto, Ont.

Tenders are being received by the general contractor, F. Markham, 156 Alexandra Blvd., on all mechanical trades for $10,000 parsonage being built at 42 Stibbard Aves. for Eglinton Ave. Methodist Church. General contractor buys material.

Westmount, Que.

Ross & MacDonald, 1 Belmont St., Montreal, are preparing plans for addition to school "Roslyn." Tenders for this work will be called early in spring.

CONTRACTS AWARDED

Brampton, Ont.

The foundations are going in for $45,000 sunday school for Grace Methodist Church. Higgins & Large have the contract for plumbing and heating. General contractor M. C. Sackrider. Architects, Horwood & White, Toronto.

Cornwall, Ont.

The following sub-trades have been let on $65,000 school being built here: roofing and plumbing—Arthur Rabineau; plastering—Jos. Bougie. Both of Valleyfield, Que.

Kingston, Ont.

The following sub-trades have been let on $103,000 addition to dormitory for Royal Military College: carpentry—S. Anglin & Co.; electric —J. Harris, 4 Cooper St.; plumbing and heating—Simmons Bros.; painting—J. Milo, Princess St. General contractor, H. W. Watts, 98 Frontenac St. All of Kingston.

Little Wood, Sask.

F. Parks, Verwood, Sask., has the general contract for school being built here.

Mount Royal, Que.

Foundations are in for $12,000 church hall on Stratford Rd. for church of England. Millwork—Traversey Ltd., 136 Papineau Ave. Roofing and electric to be let. Bremner Norris & Co., 65 McGill College Ave., Montreal, are the general contractors. Architect, F. G. Robb, 127 Stanley St., Montreal.

Montreal, Que.

N. Block, 207 Wellington, has the general contract for $75,000 garage on St. Lawrence near Mile End Station, for Bramsons Auto Service Ltd. Architect, A. B. Darbyson, 288 Madison.

L. E. Moulton & Co., Ltd., have the plumbing and heating contract for $25,000 repairs to residence at 443 University St. for Parish of Christ Church. Masonry, structural steel, millwork, electric, plastering and painting to be let. Purdy & Henderson Co., Ltd., 10 Victoria St., are the general contractors. Architects, Ross & MacDonald.

Ottawa, Ont.

The following sub-trades have been let on $18,202 addition to chemical laboratory: electric— H. L. Allen; plumbing and heating—W. G. Edge Co.; plastering—A McNulty; painting —W. J. Carson. General contractors are Wm. H. McGillivray, 458 MacLaren St. and J. E. Poirer, 440 Clarence St.

Point Grey, B. C.

Walls are going up for $30,000 fire hall corner Carter and 33rd. Ave. Contract for electrical work has been let to Universal Electric Co., Vancouver, R. P. Forshaw, 1420 7th Ave. W., is the general contractor. Architects, Gardiner & Mercer, 827 Birks Bldg., Vancouver.

Sydney, N. S.

Chapells Ltd., 62 Brookland St., have the general contract for building of $8,000 warehouse for Gunns Ltd.

Toronto, Ont.

The following contracts have been awarded for work being done on Earl Haig School; ornamental iron $966—Art Wire & Iron Co.; marble $948—Italian Mosaic & Tile Co., Ltd. Fern Ave. school; general contractors, Parkdale Construction Co., $536.

The city of Toronto has awarded the following contracts in connection with stables to be built; masonry $14,234—A. Gratton Ltd.; carpentry $8,475—A. Weller & Co.; roofing $2,420—W. G. Edge Ltd.; electric $450,—Patterson Electric Co.; plumbing $1,359—A. E. Melhuish, 1174 College St.

The following sub-trades have been let on work being done at Riverdale Collegiate; plastering $4,845—J. Mercer, 89 Barrington St.; marble $2,675—Geo. Oakley & Son, ltd.; painting $2,409—

Phinnemore Painting & Decorating Co., Ltd.; asphalt mastic $133.60—W. A. Moffatt Ltd.; exhaust ventilation $797—W. G. Edge Ltd.

Victoriaville, Que.
The general contract for $50,000 enlargement of Sacred Heart College has been awarded to Henri Levasseur, and not Levasseur & Levasseur, as previously reported.

Business Buildings and Industrial Plants

Brookfield, N. S.
Brookfield Consolidated Mines, Ltd., contemplate building an arsenic reduction plant here. Work is expected to go ahead during winter.

Campbellton, N. B.
The walls are going up for $150,000 hotel on Roseberry St. owned by Chateau Restigouche, Ltd. Heating and plumbing trades to be let. General contractors are J. & D. A. Harquail Co. Architect, A. I. Morrison.

Hamilton, Ont.
Foundations are going in for transformer and warehouse building costing $5,000 for Bell Thread Co., Ltd. Owners will receive quotations on sub-trades. No Material purchased.

London, Ont.
J. M. Totten, 14 Brighton St. is the owner and general contractor of $5,000 store and apartment on High St.

Leamington, Ont.
H. J. Heinz Co., of Pittsburgh, Pa., are having plans drawn for the erection of a factory and warehouse here. Work will likely start in the spring.

Work has just started for a hotel on Talbot St. E. C. A. Brown is the owner and will let all trades.

Murray Bay, Que.
Canada Steamship Lines, Quebec, contemplate a $20,000 addition to hotel here.

Montreal, Que.
J. E. C. Daoust, 180 St. James St., is preparing plans of office building owned by Chambre de Commerce, 76 St. Gabriel St., to be erected St. James and St. Gabriel Sts. Tenders for this work will not be called until January or February, 1924.

Overbrook, Ont.
Riverview Tennis Club contemplate building a club house here.

Port Colborne, Ont.
Marine Welding & Boiler Co. contemplate building a $10,000 machine shop corner Fraser St. and McRae Ave.

Quebec, Que.
C. Camille Lessard, civil engineer, 32 Boulevard des Allies, is preparing plans for stiff mud brick plant, and wants prices on machinery.

Regina, Sask.
Canadian National Railways contemplate building an hotel here to cost $1,000,000. Sketch plans have been submitted to city of Regina for approval.

Toronto, Ont.
Tenders are being received by the architect, F. S. Mallory, 164 Bay St., for the erection of $15,000 garage at 24-28 St. Patrick St.

CONTRACTS AWARDED

Brantford, Ont.
H. H. Butcher, 27 West Mill St., has the contract for plastering on $15,000 warehouse, office and garage being built for British American Oil Co., Ltd., General contractors are P. H. Secord & Sons Construction Co., Ltd.

Dundas, Ont.
Excavation is now in progress for factory and office building corner Brock and McNab Sts, owned by the Kaustine Co., Ltd. General contractors are F. G. Haskins & Co. Steel sash—Canadian Metal & Window Steel Products Co., Ltd., Toronto. Owner would like prices and particulars on 25 H.P. and 30 H.P. locomotive fire box type of boilers.

Hamilton, Ont.
Foundations are going in for $10,000 rendering house owned by Jno. Duff & Son, Ltd. Maritime Construction Co., Ltd., Toronto, are supervising this work. Owner will let sub-trades. No material purchased except brick and reinforced steel sash. Owner buys.

Bert Dallen, 241 Glendale Ave. has the contract for painting, and Ernie Smith, 116 Leinster Ave. the contract for sheet metal work in connection with $35,000 office and apartment building on Main St. E. at Delta. W. T. Tillotson, 1081 Main St. E., is the owner and general contractor and is receiving quotations on balance of trades.

The walls are up to 3rd storey for market being built corner Ottawa and Barton Sts., owned by W. J. Lord, James St. N. Architects, Hall & Duerr, Toronto. J. Bell, 32 Wellington St. N., has the contract for painting and plazing. Plumbing and heating trades to be let.

Montreal, Que.
Work has just started for addition to store owned by Geo. Graham, at 572 St. Catherine W. Architect, J. C. McDougall, 85 Osborne St. General contractors—H. C. Johnston Co., Ltd.; electric—Vincent & Say; marble and tiling—James Walker Hardware Co.; store front—Pilkington Bros., Ltd. Balance of work by general contractors.

S. Rochon & Fils, 624 Blvd. Gouin E., has the general contract for $12,000 extension to store owned by C. Desjardins & Co., Ltd., 130 St. Denis St. Architect E. A. Doucet, 195 St. Catherine E.

New Hamburg, Ont.
J. J. Berger has the general contract for $8,000 business block to be built corner East and West St., for J. M. Zurbrigg. Masonry—H. Schultz; roofing and carpentry—J. Hiller; electric—Geo. Morley; painting—J. Fisher. No materials purchased.

Ottawa, Ont.
Ferguson & Lambert, 643 King Edward Ave., are the general contractors for $8,000 addition to store owned by A. Shaffer, 147 Rideau St. 14,000 bricks and materials for 40 cu. yds. concrete and 10,000 sq. yds. plaster required.

Foundations are in for stores and garage corner Bank and Argyle Sts. T. C. James, 130 Flora St., is the general contractor, 30,000 bricks and material for 80 cu. yds. concrete required. Architects Richards & Abra, 126 Sparks St.

Cuthbertson & Clarke, 143 Hawthorne Ave. have the general contract for all work in connection with boiler room and dry kiln being built for D. Kemp Edwards, Ltd.

Ridgetown, Ont.
Warwick & Son have the general contract for $5,000 storage building to be built for Canada Wood Products Co.

Sault Ste. Marie, Ont.
The following sub-trades have been let on $9,000 store block being built on James St.; steel—Lyons Fuel Co.; electric—Taylor Bros.; plumbing—J. McLeod. Plastering and painting labor by owner, Emilio Albaneze, 590 Albert St. W.

Hojem Bros., 206 Albert St. E., have the contract for plastering on $10,000 store block being built on Queen St. for Harry Yates, Korah Twp. McLarty Bros., 38 Wellington St. have the general contract.

Toronto, Ont.
The following sub-trades have been let on $10,000 garage and office at 365-7 Dupont St., owned by J. Phinnemore, 367 Dupont St.; concrete work—E. Longo, 301 Osler Ave.; roofing—Feather & Roadhouse, 93 Waverley Rd.; electric—Harris Electric Shop; heating B. J. Miller & Co. Architect, F. S. Mallory, 164 Bay St.

Arthur Williams, 588 Parliament St. has the contract for painting on $15,000 addition to garage rear 621 Yonge St. Robert Page, 18 Toronto St., is the general contractor.

The following sub-trades have been let on $100,000 manufacturing building north east corner Spadina Ave. and Phoebe; roofing—Toronto Sheet Metal Co.; glazing—Toronto Plate Glass Co.; plumbing and heating—W. J. McGuire Ltd. Electric and painting to be let. L. E. Dowling, 167 Yonge St., is the general contractor. B. Brown, 287 Spadina Ave., is the architect.

Toronto Plate Glass Importing Co., have the contract for glazing, and F. G. Roberts & Co. the contract for painting, in connection with $150,000 subsidiary buildings being erected on Bathurst St. for Toronto Transportation Commission. Sullivan & Fried are the general contractors.

Vancouver, B. C.
C. W. Purdy, 1348 Barclay St., has the general contract for alterations to cafe at 841 Granville St., for Granville Lunch Ltd.

W. Tinney & Co., 623 Richards St., Vancouver, has the general contract for alterations to branch bank of Royal Bank of Canada, at 346 Hastings St. W. No materials purchased. No sub-trades let.

Windsor, Ont.
Welsh Bros., 620 Pitt St. W., have the contract for roofing of $7,000 garage being built on Church St. for E. P. Holden.

Ed. Wells, 530 Bruce St., has the general contract.

Residences

Calgary, Alta.

Excavation work is being done for $4,000 residence at 1512—16th Ave. G. R. Stubbs, 1324—12th Ave. W., is the owner and builder. No materials purchased. No sub-trades let.

Halifax, N. S.

A. M. Watson, 55 Henry St., is the owner and builder of $4,000 residence on Westmount Ave. Work day labor by owner.

Hamilton, Ont.

Tenders are being received by the owner, R. S. Mason, 41 Hilda St., no closing date set, in connection with $50,000 apartment to be built on Grosvenor St. Plans and specifications with owner.

Work is to start at once for 2 residences, $6,000, on Fairfield Ave. H. H. Turner, 68 Harvey Ave., is the owner and general contractor, and will let roofing, plastering, painting, heating, plumbing and electric trades.

J. M. Farewell, 1340 King E., contemplates building 3 residences on Hoskins property. Roofing, electric, painting, plumbing, heating and plastering to be let. Work not likely to start before spring. No material purchased.

Kitchener, Ont.

C. Dankwart, Mill St., is the owner of $4,500 residence being built on Mill St. Carpentry, roofing, heating, plumbing, electric and painting to be let. Masonry and plastering by owner.

Excavation work is being done for $4,500 residence on Weber St. Ed. Schnarr, 41 Elgin St., is the owner and general contractor. Masonry, plastering, heating, plumbing, electric and painting to be let.

L. Holle, King St., Waterloo, Ont., is the owner and general contractor of $4,500 residence on Noecker St. Heating, plumbing, electric and plastering to be let.

Longueuil, Que.

Alcide Chausse, 70 St. James St., is preparing plans for 6 cottages to be built near Montreal. Tenders for this work will be called shortly.

Montreal, Que.

R. Benoit, 73 Girouard, is the owner and builder of 2 residences, $12,000, on Girouard between Sherbrooke and C. P. R. Brickwork, millwork, roofing, electric, plastering, painting and glazing to be let.

Foundations are in for 2 residences, $14,000, on Rosemount Blvd. between 9th and 10th Aves. J. A. Duval, 22 St. Michael Blvd., is the owner and builder. Brickwork, roofing, electric, plumbing and plastering to be let.

A. Hogue, 1247 Henri Julien, is the owner and builder of 2 residences $15,000, at 2885 Park Ave. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let. other trades and all materials.

Alcide Chausse, 70 St. James St., is preparing plans for 6 residences to be built on Gilford St. Tenders will be called shortly.

G. H. Robert, 2409 Christophe Colomb is the owner and builder of $10,000 residence on Villeraie & Berri Sts. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let. Excavation and carpentry by day labor.

Excavation work is being done for an apartment house being built corner Marlowe and Sherbrooke W. W. A. Hanfield, 11 Place D'Armes, is the owner.

T. Laframboise, 3025 St. Denis, is the owner and builder of $16,000 residence on St. Denis, between Isabeau and De Castelneau. Sub-trades to be let.

Excavation work is in progress for $13,000 residence on Blvd. St. Joseph and Delanaudiere. Marie Choquette, 3816 St. Denis, is the owner. Masonry, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let. Carpentry by day labor.

Foundations are going in for $8,000 residence on St. Zotique, between Des Ecores and Poupart. L. Beaudin, 1266 Delorimier, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Foundations are going in for 2 residences, $12,000, on Des Erables, between Mt. Royal and Gilford. Owner and builder is J. Varin, 1540 Des Erables. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

A. Goyer, 191 Cote de Neiges Rd., is the owner of $18,000 residence being built on Boyer, between Francois and Jarry. Masonry, millwork, roofing, electric, plumbing, plastering and painting to be let.

Foundations are going in for $12,000 residence being built on Church, between Eadie and Riel. J. B. Labrecque, 137 Galt, is the owner. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let.

G. Gourgdin, 45 Marquette, is the owner and builder of $12,000 residence on Bellechasse, between Denormanville and Chambord. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Tenders are being received by the architect, J. E. A. Benoit, 1200 Wellington St. W., for the building of 5 flats in Pointe St. Charles Ward. No closing date set. Plans and specifications with architect.

Outremont, Que.

V. Limoges, 2594 St. Hubert, is the owner and builder of 6 flats on Querbes, near Bernard, to cost $27,000. Architect, R. Boilard, 1029 St. Denis. Sub-trades to be let.

Ottawa, Ont.

Tenders are being received till November 28 by the general contractor, S. D. Murphy, 118 Third Ave., on electric, plastering, heating and plumbing for $6,000 residence being built on Second Ave., for J. R. Buchanan. Balance of trades by general contractor.

D. J. MacDonell, 317 Clemow Ave., is the owner and builder of $6,000 residence on Sunset Blvd. No material purchased. 9,000 bricks and material for 30 cu. yds. concrete and 900 sq. yds. plaster required.

Wm. Hamilton, 22 Spencer St., contemplates building a residence on Spruce St.

David Younghusband, 322 Cooper St., is the owner and builder of 2 residences on Brighton Ave., $6,000 each. No material purchased.

Tenders are being received by general contractor, A. Villeneuve, 26 Henry St., on electric, plastering, heating and plumbing for $5,000 residence being built on Central Terrace, for J. Nevins, care general contractor. Balance of trades by general contractor.

David Arbuckle, 215 Argyle Ave., is the owner and builder of $8,000 residence on Powell Ave. No material purchased. 14,000 bricks and material for 27 cu. yds. concrete and 900 sq. yds. plaster required.

Work is to start shortly for $7,000 residence on Powell Ave. David Arbuckle, 215 Argyle Ave., is the owner and builder. No material purchased. 12,000 bricks and material for 26 cu. yds. concrete and 780 sq. yds. plaster required.

A. E. Shaver, 255 First Ave., is the owner and general contractor of $8,000 residence on Imperial Ave. No materials purchased. 14,000 bricks and material for 1,000 sq. yds. of plaster and 35 cu. yds. of concrete required.

Tenders are being received till November 24 by the owner, J. P. McDonald, 228 Gloucester St., on electric, plastering, heating and plumbing in connection with $11,000 residence being built on Powell Ave. Balance of work by day labor.

A. W. Davidson, 254 Cooper St., is the owner and general contractor of $9,000 residence being built on Daly Ave. No materials purchased. 14,000 brick and materials for 32 cu. yds. of concrete and 10,000 sq. yds. of plaster required.

Point Grey, B. C.

Excavation work has started for $5,500 residence on Angus Ave., near King Edward. Owners and builders are Mainland Building Co., Vancouver.

T. A. Kuneken, 1245 Broadway East, Vancouver, is the owner and builder of $3,500 residence at 3344—29th Ave. W. No materials purchased. No sub-trades let.

Quebec, Que.

Wilfrid Lacroix, 132 St. Peter St., is preparing plans of $15,000 residence to be built on Grande Allee St., for Henri Bray, 144 Grande Allee.

Toronto, Ont.

Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., on carpentry work (labor only) on 6 residences, $7,000, being built on Orchard View Blvd.

F. R. Phillips, 603 Jane St., is the owner and general contractor of $10,000 residence and garage being built on Humbercrest Blvd., near Baby Point Rd. Tenders are being received for electric, painting, plastering, plumbing and heating.

Footings are going in for $9,000 residence and garage west side Moy Ave., near Weatherall Ave. G. F. Cudmore, 80 Indian Grove, is the owner and builder, and employs own staff.

T. Padfield, 52 Chisholm Ave., is the owner and builder of 1 pair residences,

$7,000, west side Brookside Drive. Electric, plastering, heating, painting and plumbing to be let.

Excavation work is being done for 3 residences, $7,000, north side Bude St., near Oakwood. Owner is A. Latcham, 493 Pape Ave.

Robt. Muir, 20 Linsmore Cres., is the owner and builder of 2 pair residences, $7,500 each, east side Ladykirk, near 8th. Ave. Electric, plastering, heating, painting and plumbing to be let by owner. Masonry has been let.

Excavation work is to start for $7,500 residence west side Wychwood Ave., near Vaughan Rd. J. H. Wilson, 158 Pinewood Ave., is the owner. Trades to be let. No material purchased

Excavation work is being done for $7,500 residence and garage north side Harcroft Rd., near Olympus. Tenders are being received by the owner and builder, B. T. Huston, 208 Western Ave., on all trades except carpentry.

J. Hodgson & Son, 63 Woodmount Ave., contemplates building 1 pair residences, $7,500, west side Kent Rd., near Queen East. 2 stories, shingle and brick construction.

Foundations are going in for $8,000 residence east side McGermain and Garfield Rd. Jas. M. Vaughan, 91 Garfield Ave., is the owner and builder. Carpentry and masonry by day labor. Electric, plastering, heating, painting and plumbing to be let by owners.

Work is to start shortly for 2 residences, $4,000 each, on Inwood Ave. Robson Bros., 108 Browning Ave., are the owners and builders. Painting, plumbing, heating, plastering and electric to be let. No material purchased.

Foundations are in for $10,000 residence east side Walmer Rd., near St. Clair West. J. W. Walker, 344 St. Clair W., is the owner and builder. Carpentry and masonry by day labor. Owner employs regular staff and buys material as required.

Separate tenders are being received at once by the architects, Kaplan & Sprachman, 298 Dundas W., on excavation and concrete work for $126,000 apartment house south west corner Homewood and Wellesley Crescent.

Excavating work is being done for $10,000 residence and garage south side Dundurn Cres., near Dundurn Ave. C. Tallman, Northcliffe Blvd., is the owner. Tenders are being received on electric, plastering, heating, painting and plumbing.

The walls are going up for 1 pair residences, $7,000, west side Brookside Dr., for T. Padfield, 52 Chisholm Ave., owner and builder. Masonry day labor. Plastering, painting, heating, plumbing and electric to be let. Owner buys material.

Walls are going up for 1 pair residences, $4,500 each, at 118-20 Earlscourt Ave. Kitchen & Ansley, 1285 Dufferin St., are the owners and builders. Tenders are being received on plumbing, heating, painting, plastering and electric trades.

The walls are up for 1 pair residences, $8,000, at 68-70 Ashdale Ave. J. O. Roberts, 281 Ashdale Ave., is the owner and builder. Owner employs regular staff and buys material as required.

Tenders are being received by the owners and builders, Grimshaw Bros., 2033 Yonge St., in connection with 6 pair residences, $7,000, to be built on Orchard View Blvd.

Foundations are going in for 2 pair residences, $7,500 pair, east side Ladykirk, near Fourth Ave. W. Padfield, 69 Chisholm Ave., is the owner and builder. Electric, plastering, heating, painting and plumbing to be let by owner.

F. J. Breeze, 4 Lappin Ave., is the owner and builder of 2 residences, $4,500 each, east side Atlas Ave., near Earlsdale. Painting, plumbing, heating, plastering and electric to be let.

The foundations are in for 3 pair residences, $23,500, west side Prescott Ave., near Rockwell. F. Lowe and E. Best, 49 Carrick Ave., are the owners and builders. Plumbing, electric and heating to be let. Plastering and painting by owners.

Robt. J. Small, 95 Willer Ave., is the owner and builder of 2 residences, $4,500 each, east side Evans Ave., near Annette. Plastering, painting, heating, plumbing and electric to be let.

G. K. Halladay, 199 Dunn Ave., is owner and builder of $10,000 residence and garage south west corner Merrick and Glendale. Prices wanted at once on other trades and all materials.

Work will start shortly for 2 residences, $4,000 each, east side Meagher near Swanwick Ave. Owner and builder is C. May, 498 Main St. Plastering, paint, ing electric, plumbing and heating trades to be let. Masonry by day labor.

Tillsonburg, Ont.

Emerson Davidson, Straffordville, is the owner of 2 residences, $3,000 each, being built on King St. Work by day labor. No material purchased.

Verdun, Que.

Foundations are in for $9,000 residence on Verdun Ave. Owner is D. Herbert, 1064 Evelyn St. Masonry, roofing, electric, plumbing, plastering and painting to be let.

Foundations are in for $10,000 residence on Claude St. D. St. Laurent, 1329 Claude St., is the owner. Masonry, roofing, electric, plumbing, and plastering to be let. Painting and glazing by day labor.

J. O. Dupont, 1105 Claude St., is the owner and builder of $9,000 residence on St. Joseph St. Masonry, roofing, electric, plumbing and plastering to be let. Carpentry, painting and glazing by day labor.

Grimshaw Bros., 2033 Yonge St., are the owners and builders of 6 pair residences, $7,000, on Orchard View Blvd. Tenders are being received by owners on plastering, painting, plumbing, electric and heating; also carpentry and brickwork (labor only).

Footings are in for 1 pair residences, $5,500 each, north side Halton Ave., near Ossington. W. J. Grant, 83 Quebec Ave., is the owner and builder. Masonry by day labor. Tenders are being received on plastering, painting, plumbing, electric and heating.

F. Lusignan, 1491 Wellington St., is the owner of $13,000 residence being built on Second Ave. Masonry, roofing, electric, plumbing, plastering, painting and glazing to be let.

J. E. A. Benoit, 1200 Wellington W., is preparing plans for 12 residences to be erected here.

Perras & Goulet, 1501 Wellington St., contemplates building an $18,000 residence on Verdun Ave. Masonry, roofing, electric and plastering to be let. Plumbing, heating, painting and glazing by owners.

Excavation work is being done for $12,000 residence on Secord Ave. Perras & Goulet, 1501 Wellington St., are the owners and builders. Masonry, roofing, electric and plastering to be let. Plumbing, heating, painting and glazing by owners.

Perras & Goulet, 1501 Wellington St., are the owners and builders of $12,000 residence on Third Ave. and will let masonry, roofing, electric and plastering trades. Plumbing, heating, painting and glazing by owners. Carpentry by day labor.

Tenders are being received by the architect, J. E. A. Benoit, 1200 Wellington West, for residence to be built here. No closing date set. Plans and specifications with architect.

Vancouver, B. C.

E. R. McConkey, 3575—1st Ave. W., is the owner and builder of $3,500 residence on 1st Ave. W. No materials purchased. No Sub-trades let.

Winnipeg, Man.

Foundations are going in for $5,000 residence on Matheson Ave., near St. Cross. R. J. Davis, 455 Nairn Ave., Winnipeg, is the owner and builder.

CONTRACTS AWARDED

Aston Jct., Que.

Jos. Cormier, Ste. Eulalie, has the general contract for $10,000 office and residence being built for Alex. Gaudet. Architect, L. Caron, Nicolet, Que.

Brampton, Ont.

Wm. Marr has the contract for masonry work on $7,000 building owned by H. W. Dawson, Mayor. Tenders are being received by the owner on electric, heating and plumbing. Painting and plastering trades to be let.

Calgary, Alta.

J. Chisholm, 1136 Boulevard N. W., has the general contract for $6,000 residence being built on 23rd Ave. W., for John Dichmont, 330—23rd Ave. W. No materials purchased. No sub-trades let.

Bowden & Day, 223—12th Ave. N. W., have the general contract for residence being built at 337—20th Ave., for J. Cummings. No materials purchased. No sub-trades let.

Dunnville, Ont.

Contract for electrical work on $4,000 residence being built on John St., for Rich. Gills, has been let to Harry Foster.

Kitchener, Ont.

H. Klem, 83 King East, has the contract for heating and plumbing on $10,000 residence being built on Park St., for W. Heberbrandt, corner Cherry and Park Sts.

Moncton, N. B.

J. W. McCarthy, St. George St., has the heating contract for $5,500 residence being built on John St., for M. A. Wilcox, 312 Robinson St. Le Blanc & Babineau, 21 King St., have the general contract.

Mount Royal, Que.

Walls are going up for 4 residences, $32,000, being built for Model City Housing Co., Montreal. Roofing, plumbing and heating contract has been let to Edgar Tremblay, 267 Maisonneuve St. Electric to be let. Bremner Norris & Co., Ltd., 65 McGill College Ave., are the general contractors.

Montreal, Que.

J. Toralli, 186 St. Margaret St., has the contract for foundations for 12 residences being built on Harvard, between Monkland and Terrebonne costing $96,000. Badgley Construction Co., are the owners and builders. Sub-trades to be let.

Hickey & Aubut, 93 Dominion St., have the contract for roofing, plumbing and heating, and R. D. Clarke & Son, 26 Lincoln, the contract for plastering in connection with $15,000 repairs to residence at 595 Pine Ave., for A. Colville. Architects, Barott & Blackader; general contractor, A. K. Hutchison, 10 Cathcart. Electric and tiling to be let.

R. D. Clarke & Son, 26 Lincoln, have the contract for plastering for $12,000 repairs to residence at 715 Pine Ave. W., for J. H. Birks. Reid Bros., 2a Tower St., are the general contractors.

Hickey & Aubut, 93 Dominion St., have the contract for roofing of $20,000 residence being built on Courte, between Fort and Chomedy, for J. R. Douglas. A. K. Hutchison, 10 Cathcart St., has the general contract. Electric, painting and glazing to be let.

Jos. Brousseau, 788 St. Andre, has the contract for plastering on $65,000 apartment house on Blvd. Decarie near Brillion, for J. A. Lavoie, 665 Hochelaga. Architect, E. Latourelle, 43 Cote Place D'Armes. Lacroix & Vezeau, 371 Labrecque, are the general contractors.

Brickwork is going up on $60,000 apartment house near 642 McKay St., for M. Maron, 1195 St. Urbain St., owner and builder. Masonry and plastering—Mr. Dipeitio, 1195 St. Urbain; millwork—J. Gariepy; electric—Globe Electric Co., Ltd.; plumbing, heating and ventilating—J. E. Roy, 1426 city Hall Ave. Rofing, painting and glazing, tiling and ornamental iron to be let. H. Potvin, 26 St. James St., is the architect.

P. Girard, 288 St. Joseph Blvd., has the general contract for $10,000 residence corner Chateaubriand and Faillon, for Dr. J. A. Jarry, 3418 St. Hubert St. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Outremont, Que.

J. Martineau, 471 Orleans, has the general contract for 3 residences costing $14,000, to be built on Outremont near Van Horne, for A. Cabana, 683 Notre Dame W. Roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

J. H. Millette, 67 Breboeuf has the general contract for $15,000 residence on Querbes, near Lajoie, for A. Plamandon, 2221 Park Ave. Architects, Bernier & Despatie, Dandurand Bldg. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Following sub-trades have been let on $9,000 cottage on Dunlop near Van Horne, for V. A. Fournier, 2578B Waverley; brickwork—J. Martineau, 157 Cuvillier; roofing—J. E. Mayer, 516 Lafontaine Park; electric—H. Lamarre, 2015 Chabot; plumbing and heating—Tardif & Sarrazin; plastering—J. O. Mantel 593 Old Orchard. painting and glazing by owner. Manseau & Beaulie, 375 West Hill, are the general contractors.

Pouring concrete foundations is now being done for 6 flats being built on Wiseman, near Van Horne, at a cost of $18,000. O. Randeau, 1137 St. Denis has the general contract. Architect, E. A. Doucet, 195 St. Catherine E. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Ottawa, Ont.

Walls are up one storey for $25,000 apartment house, corner Wellington and Holland Aves, for Wm. Joynt, Laurentian View, near Ottawa. Structural steel—Dominion Bridge Co., Ltd. Electric, plastering, painting and glazing to be let. R. W. James, Creighton apartments, Queen St., Ottawa, is the general contractor.

Port Colborne, Ont.

Foundations are in for 2 residences, $3,200 each, on Steel St., for L. Turnbull. Long & Schneider, Humberstone, have the general contract. Masonry—Peter Bean, Port Colborne.

Point Grey, B. C.

Frederick Davies, 103 Carter-Cotton Bldg., Vancouver, has the general contract for $7,500 residence being built on 28th Ave., near Granville St., for E. D. Woodburn, 1555 Eighth Ave. W., Point Grey. Architects are Benzie & Bow, 618 Standard Bank Bldg., Vancouver.

A. L. Ramage, 6555 Laburnam St., has the general contract for $5,000 residence being built at 6520 Laburnam St., for T. H. Wright. Architects are Bowman & Cullerne, Vancouver, B. C.

Quebec, Que.

Excavating is being done for $8,000 residence at 171 Bougainville Ave., for O. N. Matte. 43 Richelieu St. Frs. Jobin, 7 St. Cyrille St., is the general contractor.

St. Laurent, Que.

Foundations are going in for 5 residences, $4,000 each, on Monkland Blvd. for J. J. A. Davis, 86 Notre Dame W. J. A. Grou, 236 Monkland Blvd., is the general contractor. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

St. Catharines, Ont.

H. N. Dockstader is the owner and builder of $4,000 residence at 37 Brock St. Plumbing—Bowman Bros.; electric—F. C. Crawford, Ottawa St.; plastering—A. B. Barratt. Painting and heating being done by owner.

A. B. Barratt, Rodman St., has the plastering contract for $4,000 residence at 35 Brock St. H. N. Dockstader, 29 Brock St., is the owner and builder.

Sandwich, Ont.

The contract for plastering on $14,000 duplex residence on Partington Ave., has been let to Sallan & Co., Wyandotte St. Prince Bros., Windsor, Ont., are the owners and general contractors.

Toronto, Ont.

J. Ritchie, 718 Annette St., has the contract for electrical work on $12,000 duplex residence being built at 566 Durie St. for G. H. Blyth, 566 Beresford Ave. E. Maxwell, 82 Kenneth Ave., is the general contractor.

Following sub-trades have been let on $9,000 residence and garage south side Riverside Rd. near Mossom Rd.; electric—Wm. Bloomfield, care general contractors, Parkdale Concrete Co.; plumbing—H. L. Bythell, 897 College; heating—Robt. Steen, 9 Grimthrope; plastering—J. Rushton, care general contractors.

Alf. Spicer, 128 Barrington Ave. has the contract for masonry work on 3 pair residences, $7,000 a pair, west side Brookside Drive near Burgess Ave. W. Brown, 10 Ladykirk Ave. is the owner and builder, and employs regular staff. All materials purchased.

Following sub-trades have been let on 1 pair residences, $8,000, west side Brookside Drive near Burgess; electric—T. B. Kilner, 601 Jones Ave.; plumbing—Chas. Legg, 120 Barrington Ave.; heating—Mason & Allen, 400 Morley Ave.; plastering—Hope & Tapper, 989 Eastern Ave.; painting—W. Scott, care owner, Alf Spicer, 128 Barrington Ave.

The following sub-trades have been let on 3 pair residences, $6,000 each, north side Rhyl, near Haslett Ave.; heating—H. Cook, 69 Sprucehill Rd.; plumbing—Chas. Frampton, 169 Greenwood; plastering—H. Hill, 16 Lawlor; electric—Elect Electric Co., 113 Victoria. Painting being done by day labor. King Bros., 6 Neville Park Blvd., are the owners and builders.

Walter Oborne, 144 Glengrove Ave. E., is the builder of $25,000 residence and garage north side Kilbarry Ave., near Warren Rd., for G. Booth, 214 Heath St. General contractor supervises all work and purchases material as required.

Foundations are going in for $15,000 residence and garage, west side Indian Grove, near Indian Valley Crescent. Masonry — Alex. Williams, 73 Willard Ave.; carpentry—A. S. Raymond, 15 Radford Ave. Painting, plumbing, heating, plastering and electric to be let by owner, G. S. Sanderson, care W. H. Smith, 291 Indian Rd.

Walls are going up for 2 duplex residences, $30,000, corner Parkside Drive and Valley Crescent. Following sub-trades have been let; electric — Geo. Armstrong, 1319 Ossington Ave.; plumbing and heating—Thos. Maxwell, 1221 College St. Painting by owner, J. Ewing, 1625 Bloor W. Plastering by day labor.

The footings are going in for 3 residences, $18,000, at 271-3-5 Concord Ave. D. Patterson, care general contractor, John Lambert, 312 Westmoreland Ave., is the owner. Masonry, 337 Rusholme Rd. Tenders being received by general contractor on other trades.

Contract for tiling for residence and garage on Russell Hill Rd., being built for W. C. Kettlewell, 72 Heath St. W., has been awarded to Italian Mosaic & Tile Co., Ltd. Architect, W. F. Shepperd, 774 Shaw St.

Following sub-trades have been let on 1 pair residences, $6,500 each, east side Kenwood Ave., near Louisa; builder—

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Niagara Falls, Ont.

Tunnel Excavation

Sealed tenders addressed to the undersigned and endorsed "Tenders for Tunnel Excavation," will be received until twelve o'clock noon,

Saturday, December 1st, 1923,

for the extension of the Scenic Tunnel at Table Rock, Niagara Falls, Ontario.

Plans may be seen and specifications with form of tender obtained at the office of the Queen Victoria Park Commissioners, Niagara Falls, Ont. Tenders must be accompanied by a marked cheque for at least 5% of the amount of tender.

The lowest or any tender not necessarily accepted.

(Sgd.) JOHN H. JACKSON, Supt.,
Queen Victoria Park,
Niagara Falls, Ont.

Niagara Falls, Ont.,
November 17th, 1923. 47-48

CITY OF TORONTO

Tenders for Annual Supplies

Tenders will be received, by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon,

Tuesday, November 27, 1923,

for the supply and delivery of:

Tender No.
1—Brass and Bronze Castings.
2—Brass Work for House Services.
3—Cast Iron Pipe.
4—Hydrants.
5—Pipe Fittings and Valves.
6—Lead Pipe.
7—Special Castings.
8—Stop Valves.
9—Refined Asphalt.
10—Paving Blocks, Vitrified.
12—Sewer Brick.
13—Flat Castings.
14—Portland Cement.
15—Mineral Dust or Filler.
16—General Supplies and Tools.
17—Gravel, Screened and Unscreened.
18—Granite Setts.
19—Iron and Steel.
21—House Numbers.
22—Oils, Lubricating, Fuel, etc.
23—Sewer Pipe.
26—Rubber Valves, Hose, etc.
28—Sand.
29—Crushed Stone.
30—Rubble Stone.
32—Bleach.
34—Liquid Chlorine.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply strictly with conditions of City By-law as to deposits and sureties as set out in specifications and forms of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE (Mayor),
Chairman Board of Control,

November 9th, 1923. 47

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

DEPARTMENT OF ROADS

TENDERS

LaPrairie-LaColle Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—Montee Frechette," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until one o'clock in the afternoon, on

Tuesday, the eleventh (11th) of December, 1923,

for the resurfacing with an oiled waterbound macadam of the Montee Frechette, in the county of St. John, between the parishes of St. Luc and of St. John, length 4,074 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.

Quebec, November 19th, 1923. 47

Niagara Falls, Ont.

Tenders for Two Concrete Arch Bridges

Sealed proposals addressed to the undersigned and endorsed "Tender for Concrete Arch Bridges" will be received until twelve o'clock noon

Saturday, December 1st, 1923,

for the construction of two concrete arch bridges.

Plans and specifications may be seen and form of tender obtained at the offices of the Queen Victoria Park Commissioners at Niagara Falls, Ontario.

Each tender must be accompanied by an accepted cheque made payable to the order of the Queen Victoria Park Commission for at least 5% of the amount of the tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
Superintendent.
Queen Victoria Niagara Falls Park Commission,
Niagara Falls, Ontario.

47-48

Tenders Wanted

BOARD ON EDUCATION

Sealed tenders, addressed to the Business Administrator & Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, November 27th, 1923,

for

(a) Masonry, Structural Steel, Carpentry, Ornamental Iron, Plastering, Painting and Glazing, Plumbing, Heating, Ventilation, Electric Wiring, Phones, Clocks, Marble and Terrazzo for **HUMBERSIDE COLLEGIATE (Completion of Assembly Hall)**
(b) Ornamental Iron for **SILVERTHORNE SCHOOL.**
(c) Ornamental Iron for **RIVERDALE COLLEGIATE.**

Specifications and conditions for tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretariai Department at the Administration Building, 155 College St., **not later than 4 p.m.** on the day named, at which time they will be opened and after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Administrator & Secretary-Treasurer...
F. E. POWELL,
47 Charman Property Committee.

Wanted

Cyclone Well Drill to handle 4¼ inch stem, 20 feet long. Raw Construction Company, Toronto. 47

LOCOMOTIVES, NEW

30-in and 36-in. gauge, 23 tons, Tractive Power, 9000 lbs. coal, oil or wood burners.

Very attractive prices.

R. POLIAKOFF,
709 Sixth Ave., New York, N.Y.
47 and 50

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same. Box No. 407, Contract Record, Toronto. 44 T.f.

STEEL PILING

Bought and Sold

Universal Equipment Company
28-t f. Niagara Falls

TOWNSHIP OF ETOBICOKE

GRADING

Sealed tenders plainly marked as to contents will be received up to 12 o'clock noon of

Monday, November 26th, 1923,

for approximately 5000 cubic yards of grading.

Plans and specifications may be seen, and forms of tender obtained at the Township Offices, Islington.

The lowest or any tender need not necessarily be accepted.

N. MacNICOL,
Township Engineer,
Islington, Ont.

47

Machinery for Sale

1—reversible builders hoist.
1 6-H.P. Ideal gas engine.
1 double cage builders elevator 75 foot lift.
1 pole derrick.
1 No. 6 London Concrete mixer.
1 5-H.P. electric motor.

W. J. Hickey,
47-48 119 East Main St., Welland

Residences

(Continued from page 53)

J. H. McClarty, 1202 Dufferin; masonry—E. Cox, 411 Symington; plumbing—J. T. Henry, 8 Louisa Ave., Wychwood. Painting, heating, plaster and electric to be let.

Stanley A. Waggett, Alcorn Ave., is the builder of 2 residences, $5,500 each, east side Winnett Ave., near Vaughan Rd., for H. Craven, and will let the electric, plastering, painting, roofing, plumbing and heating.

Mason & Allen, 400 Morley Ave., have the heating contract for 4 residences, $4,000 each, north side Lyann Ave., near Kingswood Rd. J. J. Smith, 302 Milverton Blvd., is the owner and builder. Masonry and painting by day labor. Owner employs regular staff for all other trades.

Vancouver, B. C.

Work has commenced for $6,900 alterations to boarding house at 1001 Georgia St. W., owned by B. T. Rogers Estate, 1531 Davies St. Dominion Construction Co., 509 Richards St., are the general contractors. Electric, plumbing, plastering and painting trades not yet let.

Verdun, Que.

Following sub-trades have been let on $10,000 cottage being built on Lasalle Rd.; masonry—T. Gagnon, Wellington St.; electric—S. Quesnel, 309 Church Ave.; plumbing—Z. & O. Cadieux, 1256 Wellington St.; heating Reid Cambridge, Green Ave.; plastering—O. Aubertin, 739 Lasalle Rd.; painting and glazing—Mr. Mechelin, care general contractor, G. H. E. Blacklock, 104 Crescent. Roofing by general contractor.

Victoria, B. C.

Peter McKechnie, 2358 Cadboro Bay Rd., has the general contract for $15,000 residence being built on Shasta Ave., for Miss H. Nation.

Windsor, Ont.

J. Manseau, 420 Brock St., Sandwich, Ont., has the general contract for $4,000 residence on Howard Ave., for R. Rilner, 711 Third St., Detroit, Mich. Electric, plumbing, plastering and painting to be let.

S. Wilson, 189 Goyeau St., has the plumbing and heating contract for $4,500 residence being built on Hall Ave. Wm. Buttery, 605 Moy Ave., is the owner and builder. Electric, plastering and painting to be let. Foundations are going in for $6,500 residence on Hall Ave., for H. St. Ouze, Wyandotte St., owner and general contractor. A. D. Belair, Dougall Ave., has the contract for plumbing and heating. Electric, plastering and painting to be let.

R. W. Holloway, 358 Lincoln Rd., Walkerville, has the general contract for $9,500 duplex residence on Gladstone Ave., for T. Johen, Maidstone. Carpentry, electric, plumbing, plastering and painting to be let. No materials purchased.

J. A. Fletcher, 106 Shepherd St., is the general contractor for $7,500 duplex residence on Giles Blvd., being built for Jno. E. Williams, 11 Elm Ave. Electric, plumbing, plastering and painting to be let.

Power Plants, Electricity and Telephones

Brockville, One.

A by-law is to be submitted to ratepayers on January 1st to authorize sale of debentures for $13,000 to purchase gas engines for hydro-electric station.

Timmins, Ont.

Tenders have been received for the construction of $50,000 electric sub-station for the Hollinger Consolidated Gold Mines, Ltd. Architects are Kerry & Chace, Ltd., Toronto.

CONTRACTS AWARDED

Jonquiere, Que.

The contract for generator in connection with $75,000 extension to hydro-electric power development has been awarded by the town council to Canadian General Electric Co., Montreal, Que. Work by day labor. J. F. Grenon, Chicoutimi, is the engineer in charge of this work.

Timmins, Ont.

Canadian Bridge Co., Walkerville, have been awarded the contract for steel for power transmission line, Island Portage to Timmins, for Hollinger Consolidated Gold Mines, Ltd. Tenders are being received for erecting towers and wiring. Engineers are Kerry & Chace, Toronto.

Toronto, Ont.

Foundations are going in for $160,000 sub-station south east corner Danforth Ave. and Morton Rd., for Toronto Elec. Commrs. Following sub-trades have been let; ornamental iron—Mahaffy Iron Works; steel sash, kalamein and sheet metal work—A. B. Ormsby Co., Ltd. Roofing, painting and plastering to be let. Jackson, Lewis Co., Ltd., are the general contractors.

The following sub-trades have been let on $12,000 annex to sub-station corner Duncan and Nelson Sts., for Toronto Electric Commissioners; steel—Reid & Brown; roofing—W. E. Dillon & Co., Ltd.; painting—J. McCausland & Son. General contractors are Archibald & Holmes.

Miscellaneous

Toronto, Ont.

The city of Toronto, through C. A. Maguire, chairman Board of Control, is receiving tenders till November 27 for miscellaneous waterworks fittings, sewer pipe, gaving materials, and general supplies. Plans and specifications at room 12, city hall.

CONTRACTS AWARDED

Port Stanley, Ont.

The general contract for harbor improvements costing $50,150, has been awarded to Port Arthur Construction Co., Ltd., of Toronto, Ont. H. B. Craig, Royal Bank Bldg., London, Ont., is the engineer in charge of this work.

Late News

Campbellton, N. B.

Walls are up one storey for $150,000 hotel on Roseberry St. A. H. English has the contract for plumbing and heating. All other trades under general contractors, J. & D. A. Harquail Co.

Montreal, Que.

The following sub-trades have been let on $60,000 residence corner Robin and Amherst; brickwork—J. W. Gauthier 1294 Ontario; millwork—Rosemount Lumber Co., Ltd.; roofing, plumbing and heating—E. Tremblay, 13 Perreault Lane; electric—J. A. St. Amour, 2171 St. Denis. Plastering, painting, Glazing, tiling and ornamental iron to be let.

Walls are going up for $90,000 factory on Ste. Catherine East, for Dominion Oilcloth & Linoleum Co. Following sub-trades have been let; roofing—Metal Shingle & Siding Co., Ltd.; plumbing and heating—John Colford & Co; painting and glazing—Alex. Craig Ltd.

New Westminster, B. C.

Dominion Bridge Co., Montreal, Que., have the general contract for repairs to bridge across Fraser River, to cost $50,000.

Outremont, Que.

The general contract for $60,000 apartment house on Joyce, corner Wiseman, has been awarded to J. C. Julien, 780 Lacombe. C A. Fortin, 816 Durocher, is the owner.

Perreault & Gadbois, 2100 Park Ave., are preparing plans of $75,000 apartment house to be built on Laurier, north east corner Querbes, for Dr. L. O. Bournival, 155 Bloomfield. Tenders to be called shortly for excavation and foundations only.

St. Marys, Ont.

The town council is having plans prepared for $10,000 extension to electrical system.

Toronto, Ont.

Tenders are being received till November 27 by the Board of Education, for necessary work to complete assembly hall for Humberside Collegiate.

The Board of Education will receive tenders till Noverber 27 for ornamental iron work for Silverthorne school and Riverdale collegiate.

Victoria, B. C.
Work is to start at once on $23,950, office building. Williams, Trerise & Williams, Victoria, are the general contractors.

Weston, Ont.
Plastering, painting and glazing trades are to be let on $40,000 telephone exchange being built here.

Windsor, Ont.
Dickie Construction Co. Ltd., have the general contract for addition to bank of Montreal, corner Ouellette and Chatham streets. Kenneth G. Rea. 285 Beaver Hall Hill, Montreal, Que., is the architect.

Winnipeg, Man.
Tenders will be received by the chairman, Committee on Public Utilities, until November 26 for the supply and delivery f.o.b. cars Winnipeg, of three 250 K. W. self-cooled transformers, 2,200/550 volts, 60 cycles. Specifications and form of tender may be obtained at the office of the city of Winnipeg Hydro Electric System, 55 Princess street.

Tenders for the construction of a sewer in Lanark St. around first bay from the south line of Lot 38 to the east line of lot 30, will be received till November 26 by the chairman, Committee on Public Utilities. Specifications and form of tender may be obtained at office of the city engineer, 223 James St., Winnipeg.

Tenders will be received by the city of Winnipeg, through the chairman, Committee on Public Utilities, till November 26, for the supply and delivery f.o.b. city yard, Winnipeg, on cast iron pipe; 500 lin. ft. 4 ., 1,000 ft. 10 in., 3,000 lin. ft. 6 in., 1,500 lin. ft. 14 in. Specifications and form of tender at office of the city engineer, 223 James St., Winnipeg.

The New Viaduct Proposal

At a conference held on Nov. 16 between the president of the Canadian National Railway System and Canadian Pacific Railway Company and the Harbor Board and Board of Trade of the city of Toronto, the railway presidents proposed to build that portion of the original viaduct to the east of Yonge Street. bridges to be built at Yonge St. and across streets west of Yonge. It was claimed that this arrangement would save the city $4,000,000. The total cost under the new plan is estimated at $20,500,000 as campared with $34,000,000 under the old plan.

Riveted vs. Welded Tanks

For the purpose of ascertaining the relative merits of riveted as compared with electric-welded tanks, four steel tanks, 4 ft. in diameter and 10 ft. long, made of 5/16 in. mild steel plates, were tested under hydrostatic pressure by the American Bureau of Standards. The tanks were designed for a stress of 16,000 lb. per square inch, at a working pressure of 200 lb. per square inch. Two of the tanks were butt-welded, one was lap-welded, and the fourth was of the ordinary lap-riveted construction. The ends of the tanks were spherical, having a radius of 4 ft. Strain gauge measurements were made at various portions of the tanks and at pressure increments of 50 lb. per square inch until failure. The results of the hydrostatic test proved rather unsatisfactory as a comparison ot the relative strengths of the different types of construction. On account of secondary failures, such as leaks around the fittings, the possible strength of the tanks was not reached. In fact, the secondary failures were responsible for fracture in each case. In one tank the failure was at the weld around a 2 in. pipe outlet in the second, at the manhole; in the third, at the end transverse weld; and in the riveted tank at the end transverse riveted joints. The first two failures might have been obviated by better welding of the pipe fittings and manhole saddle to the shell. Extra reinforcement at the junction of the spherical end to the cylindrical shell would have reduced the stresses at the junction where the other two tanks failed. The location of the end transverse seam or riveted joint further back on the shell of the tank would have taken this joint out of the region of high stress intensity caused by the abrupt change in direction of force at the junction of the spherical end of radius 4 ft. to the cylindrical shell of radius 2 ft.—"The Engineer."

Government Bonds for Contractors

During the winter season many of our contractors buy short dated bonds to keep their funds employed.

Call us and let us explain

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Special Toronto Representatives

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FIDELITY AGENCY OF CANADA LIMITED
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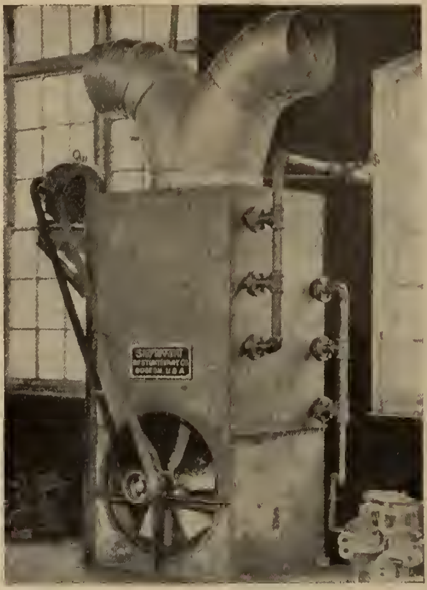

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Air Driven Locomotives in German Mines

Compressed air locomotives are quite numerous in German mines. In the Dortmund district alone there were 624 in 1920, and they hauled about 15,000,000 tons of coal during that year. The compressed air in the storage mains is maintained at a pressure of about 3,000 pounds per square inch. The storage charge for the locomotive, which starts at approximately this pressure, is carried in long weldless steel cylinders, three or four in number and twelve to eighteen inches in diameter. They are practically as long as the locomotive and leave a seat for the driver in the rear. The necks of the bottles or receivers are held in place by a vertical plate, while the other or forward ends are held by a stout strap attached to the frame below. In operation, the air flows from the storage through a pressure reducer to a receiver, where a constant pressure of about 200 pounds is maintained.

The air, after leaving the first or high-pressure cylinder where it is used expansively, passes through a series of tubes in which its temperature is raised or restored to that of the mine air, and then it does its final work in the low-pressure cylinder. The distribution of the air is controlled within wide limits by balanced-piston valves and a link motion just as in a steam locomotive. With one charge of air the engine can travel with its load about six miles. The locomotives serve either as main-road or gathering locomotives, and weigh from 3½ to 7 tons. Their power is from 10 to 30 H.P. Still larger locomotives are used for tunnel work and in plants exposed to the danger of fire.

Panama Canal

Excavation from the prism of the Panama Canal by the forces of the United States, to July 1, 1923, aggregated 262,392,915 cu yd., according to a compilation recently completed by engineers of the dredging division. In addition, states the Panama Canal Record, the forces of the United States have excavated, to that date, 54,534,135 cu. yd. from places outside of the canal prism proper, principally in the terminal harbors. The total of these two figures is 316,927,050 cu. yd. Excavation by the French companies useful to the completion of the present canal has been estimated at 29,908,000 cu. yd. The canal of today accordingly represents an aggregate excavation of 346,835,050 cu. yd. Since 1914 the bulk of the excavation has been classed as maintenance; and of this the greater portion has been due to slides in the Gaillard Cut. The total excavation since 1924 has amounted to 74,759,000 cu. yd.

Work on Toronto Suburban Lines

General manager H. H. Couzens has announced that considerable work will be undertaken immediately on the suburban lines just purchased by the city. Operations will be carried on on Dundas Street, day and night, and following that, on Keele Street north to St. Clair. The work is being rushed on account of the necessarily short period of time that must elapse before the cold weather sets in.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

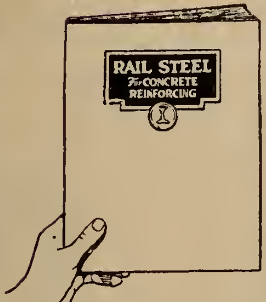
Specifications

A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff) made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steel."

Specification A-16-14 is, therefore, everything that a specification should be. It is a protection to the purchaser. It asures him of getting Rail Steel Bars, proven by over 3,000 tests to have a quality factor (strength and ductility) in excess of usual grades of steel. This specification at the same time prevents any substitution of undesirable re-rolled

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal



You will be interested in the facts contained in this valuable book. A copy is yours for the asking.

Burlington Reinforcing Bars used in construction of Warehouse for Crane Limited, Toronto, erected 1922

Anglin-Norcross, Limited,
General Contractors

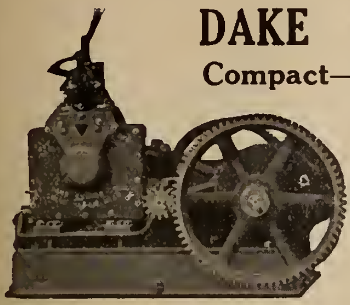
Wm. Steele & Sons,
Architects

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.05	1.50	2.75 “	“ “
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 “	“ “
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 “	4.50 “	5.40 base	
Hoops	per 100 lbs.	5.00 “	5.00 “		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 “	4.00 “	5.45	6.00
Structural shapes	per 100 lbs.	4.25 “	4.25 “	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 “	3.90 “	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 “	4.25 “	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 “	4.50 “	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 “	5.00 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.50 “	7.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 “	7.00 “	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 “	6.00 “	7.50 base	
Cast iron pipe	per ton	67.50	60.00 “		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS:—.Discount on flue linings is 55%

**Toronto prices include sales tax.



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Standard, 36" and 24" Gauge

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Ballast; 20 yard; 6 yard; 4 yard;
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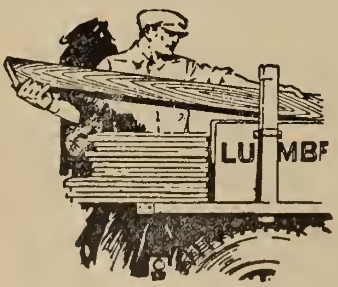
CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	**per hr.**	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	**per hr.**	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.



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Capacity of Plant: 25 Cars Per Day

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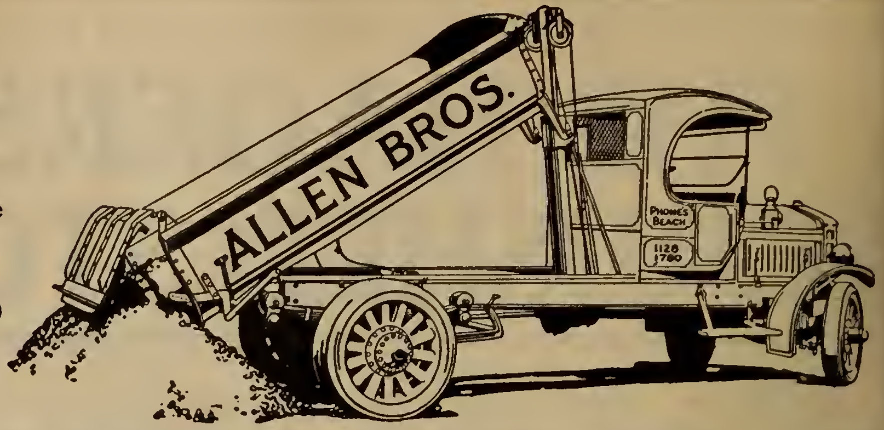

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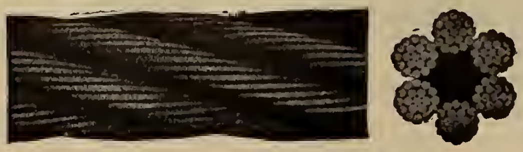

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For each successive installation our engineers studied space conditions, capacity requirements and pressure-volume characteristics, selecting from among our designs the sizes and types to give the best results. This service is at your command not only for power plant equipment but also for fan system heating, ventilating, air conditioning and drying installations, blowers, conveyor fans and forge shops. Write for Catalog to Dept. 12.

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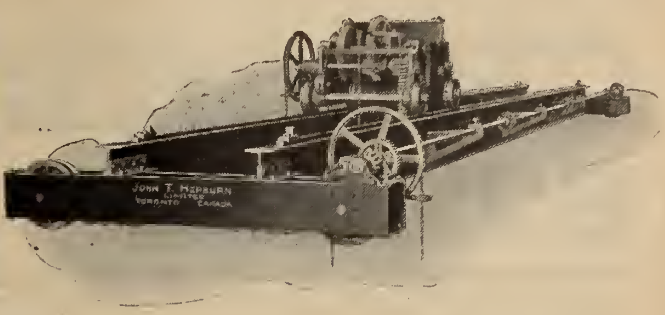

Overhead Cranes

Hepburn Overhead Cranes are made in all sizes and have proved their reliability in machine shops, industrial plants, foundries, stone yards, Quarries, etc., from coast to coast. Illustration shows Hepburn 8-ton overhead crane with 45′ 0″ span, Double I Beam type.

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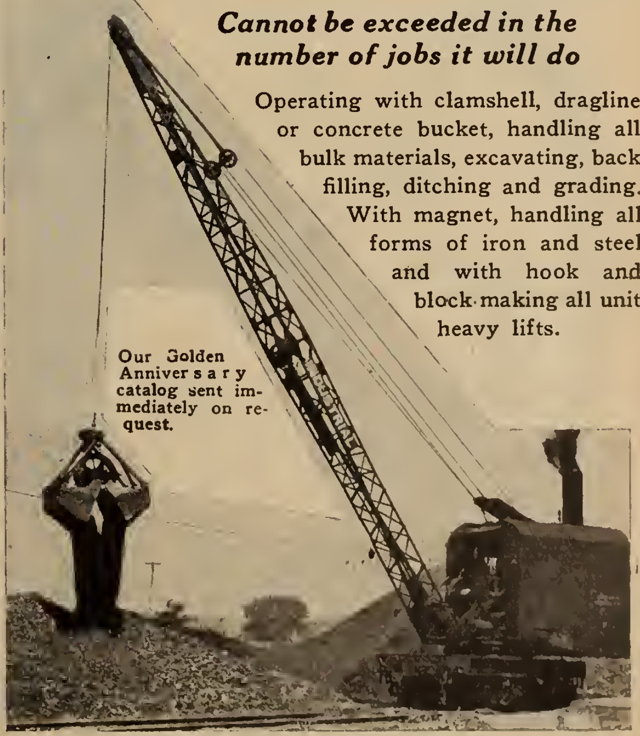

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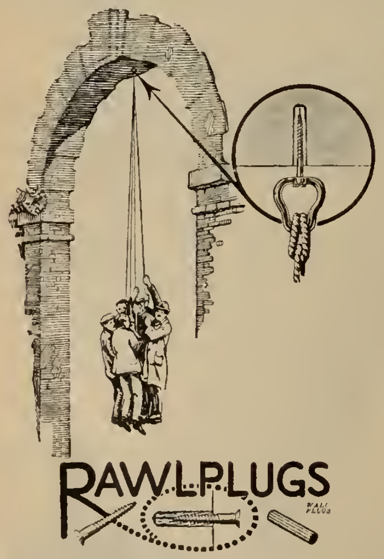

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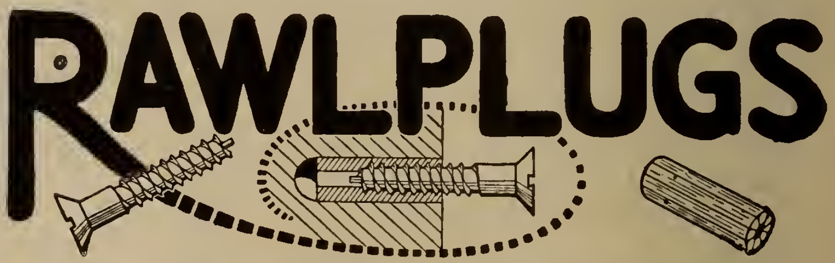

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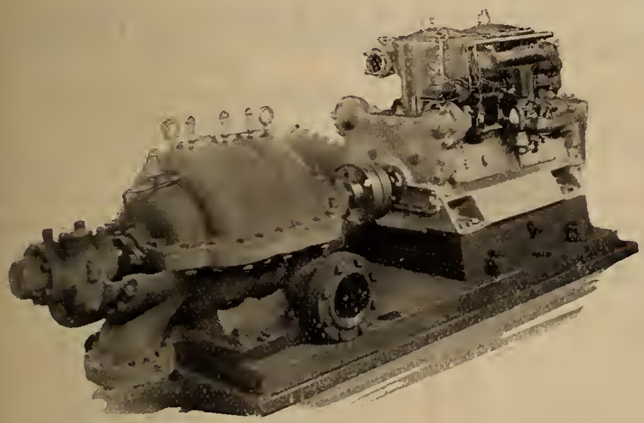

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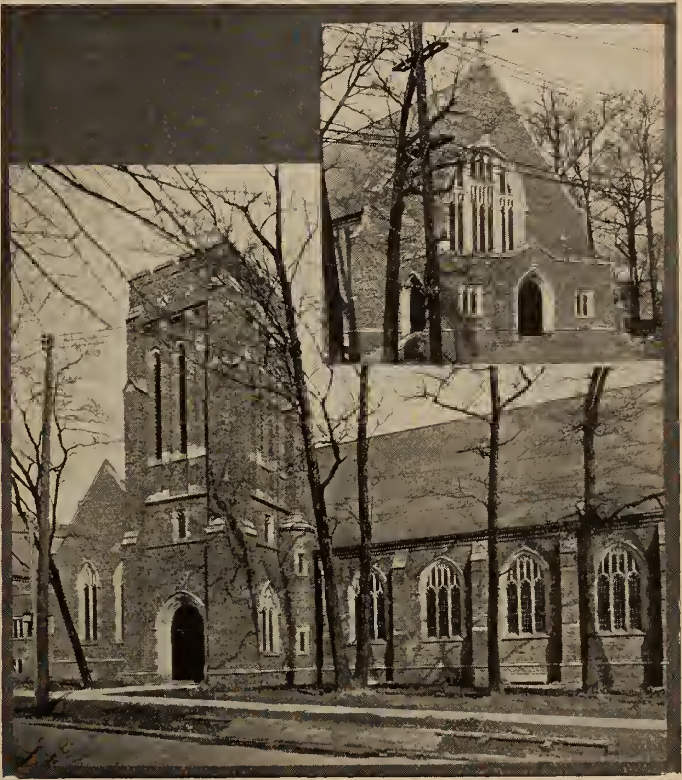

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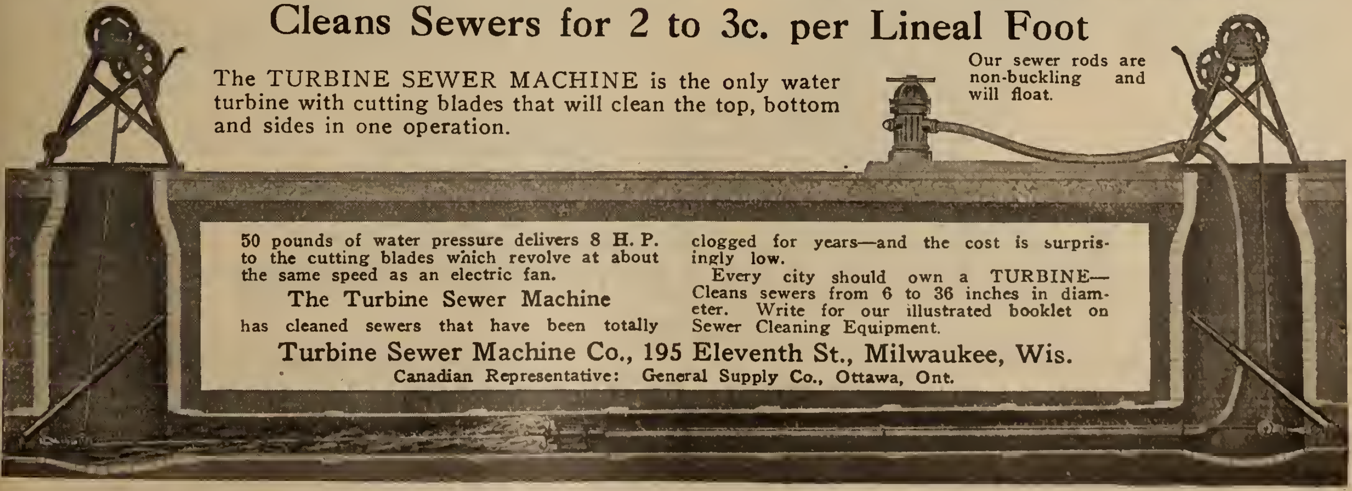

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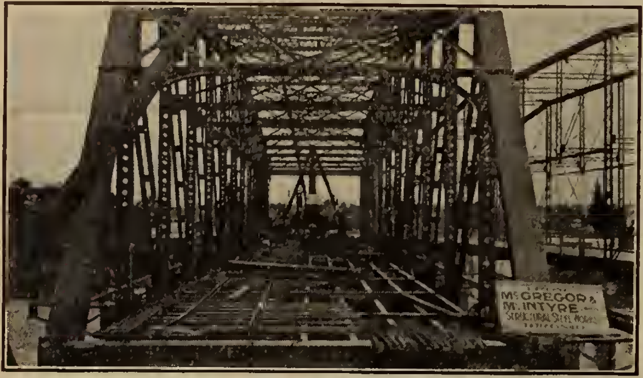

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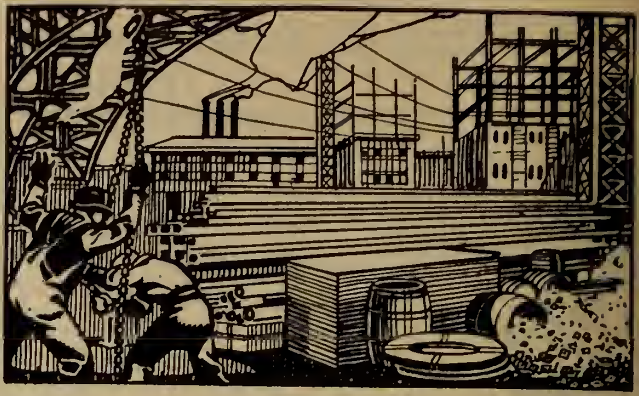

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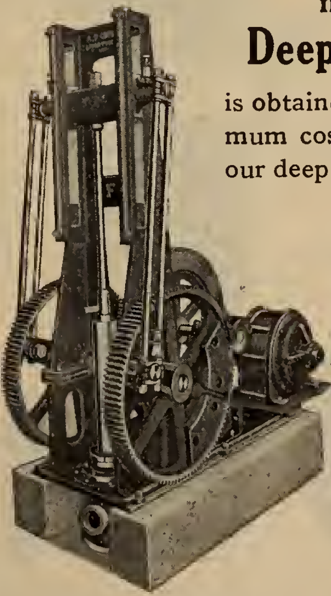

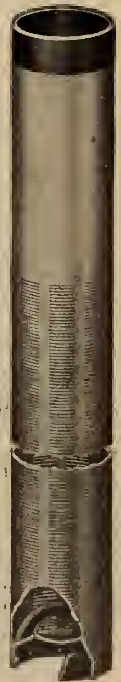

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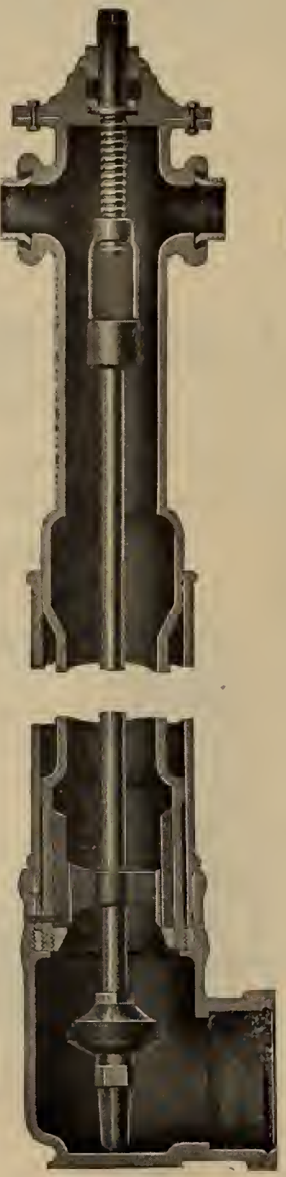

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For All Electrical Installations

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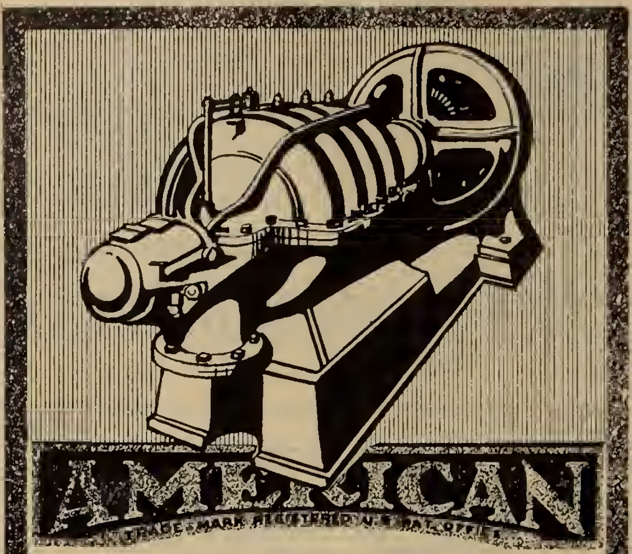
AMERICAN
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Think of the economy that would result to industry as a whole if "American" Centrifugals, Deep Well Plunger Pumps and Deep Well Turbines were used—with their long term service, high efficiency and low maintenance cost.

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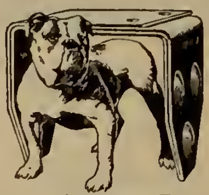
BULL DOG FLOOR CLIP



Put the Bull-Dog on *your* Pay-roll

With this device it is possible to secure the advantages of wood floors in reinforced concrete buildings—at an economical cost, at a vital saving of time, and with a reduction of 18,000 lbs. dead load per 1,000 sq. ft. Conceded by the leading architects and builders to be the best device of its kind and 100 per cent efficient. More than ten million sold last year on the American market.

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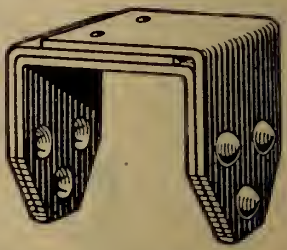

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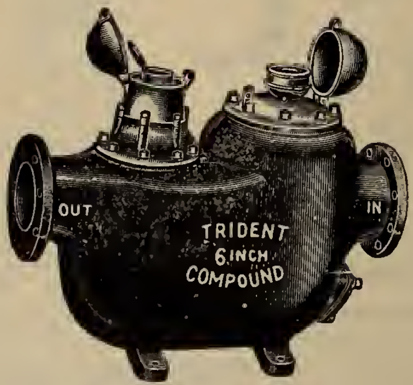
Trident Compound



Until the Trident Compound appeared on the market no meter had ever been devised that would **accurately** measure "all the water all the time."

Nor has there been any other since.

The Trident Compound is in a class by itself.

It is really two meters in one—a Disc chamber for measuring low flows and a Crest chamber that takes care of everything from the latter up to the full capacity of the meter.

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Limited
Consulting and Inspecting Engineers
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Expert inspection and tests on all materials and equipment.

Assure yourself materials purchased are to specifications, also prevent delay in deliveries by marking your orders subject to, "HUNT INSPECTION."

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Moves over soft and muddy ground without planking

CLIMBS GRADE as steep as 30 per cent. (engineer's measurement).

POWER STEERING from the cab. No man needed on the ground. COMPLETE LUBRICATION which gives greater speed and more power.

A RELIABLE Caterpillar type Steam Shovel

Excavating men tell us, "It is the greatest improvement in excavating machinery in the past 10 years." We'll be glad to send you more information about the ERIE caterpillar type mounting. Just write for Bulletin C-60.
Erie Steam Shovel Co., Erie, Pa., U.S.A.

ERIE Revolving Shovels
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We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
Harbours	**Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.
Engineers and Contractors
Head Office: Lumsden Bldg., Toronto

The RIGHT CRANE for the RIGHT PURPOSE
Will Always Produce Results

O. S. DEPENDABLE Locomotive Cranes have reduced the cost of material handling to a minimum wherever installed. Manufactured in sizes from 7 to 60 tons capacity; mounted upon crawling tread, rail wheels or broad faced road wheels; steam, electric or gasoline driven; equipped with automatic devices for the economical handling of materials.

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Flanged Ts., Bends, etc., made to any specification.

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Contractors for Waterworks Construction,
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See our new patented Wood Pipe Coupling—Positively LEAK PROOF
We are the originators of the BORED OUT Wood Sleeve Coupling
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Sauerman Power Drag Scrapers
If you want to learn all about the most economical method of working bank deposits of sand and gravel, write for our Pamphlet No. 16.
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for Interior Construction

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Sole Manufacturers under Canadian and U. S. Letters Patent
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ELECTRIC TIME SYSTEMS
Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

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CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

HEAD OFFICE:
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Works at: Fort William, Ont., St. Thomas, Ont
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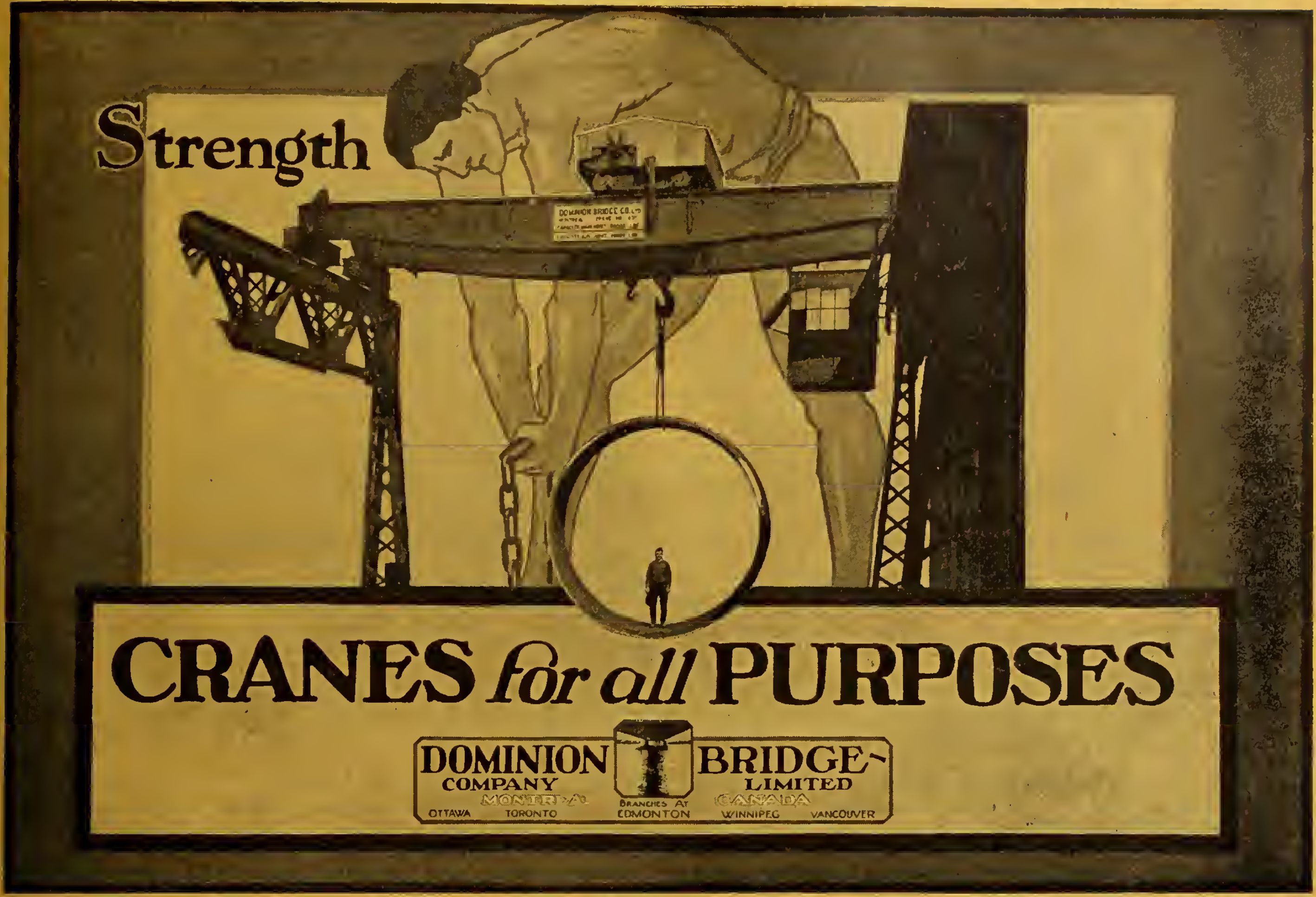

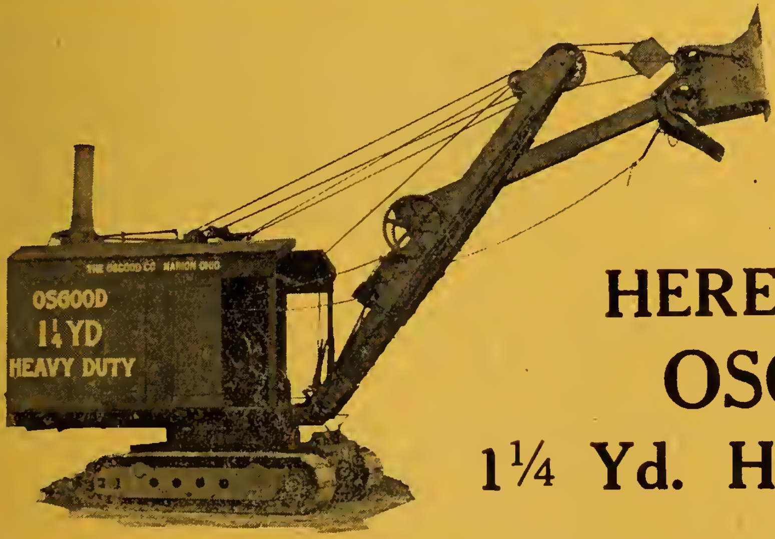

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OSGOOD
1¼ Yd. HEAVY DUTY

Steam Shovel Buyers have been asking us for a 1-¼ Yd. Shovel having embodied in it OSGOOD Design and Quality.

OSGOOD 1-¼ Yd. HEAVY DUTY is here to meet this demand.

You will like this 1-¼ Heavy Duty when you see it. Get our new Bulletin 236, just off the press, for detailed description.

¾—1—1¼ yd. Revolving Steam Shovels, Clamshells and Draglines.
1½ to 6 Cu. yd. Railroad Type Steam Shovels.

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Marion, Ohio, U.S.A.

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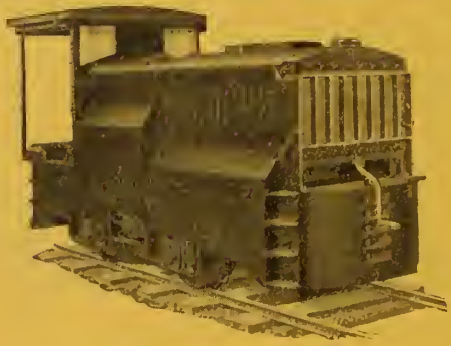
Wire Rope

MANUFACTURED IN CANADA
For Users Who Want the Best

THE DOMINION WIRE ROPE CO., LIMITED
Head Office: MONTREAL Also at: TORONTO-WINNIPEG



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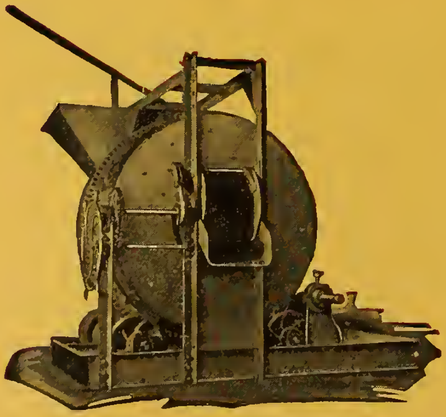
Gasoline Locomotives

"RANSOME"
Concrete Mixers



"MARION" Steam Shovels
are breaking all records on the
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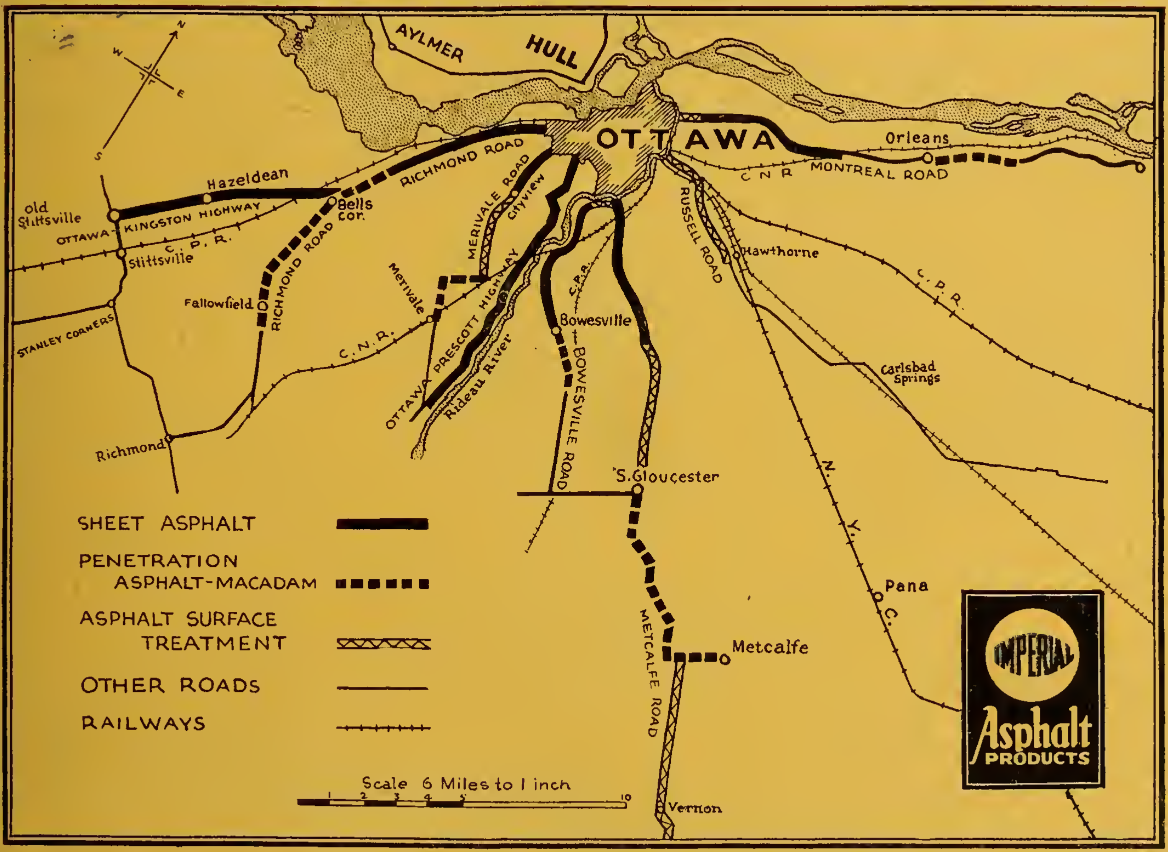
Vol. 37 Toronto, November 28, 1923 No. 48

Contract Record and Engineering Review



75 Miles of Asphalt Roads Serving Ottawa Suburban Districts

Three years ago the main roads out of Ottawa were in the hands of toll companies and were in bad condition. The Ottawa Suburban Area Roads Commission was then formed, and an active road improvement programme has since been maintained, both by the Commission and the Provincial Government.

The general plan has been to build first as many miles as possible of water-bound macadam roads, to serve the greatest area with the least financial outlay. These roads were maintained with bituminous surface treatments until, as traffic increased, they have been surfaced with Sheet Asphalt or Penetration Asphalt Macadam, according to their importance.

Road improvements along these lines are sound, because all investments are carefully conserved, and a maximum mileage of first-class roads is thus obtained at a minimum cost.

We have prepared a special illustrated folder dealing at greater length with the roads serving Ottawa Suburban Districts. We shall be glad to send you a copy on request.

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto Canada

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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EFFICIENCY!

Steel
Double-Coupling
eliminates
all leaks

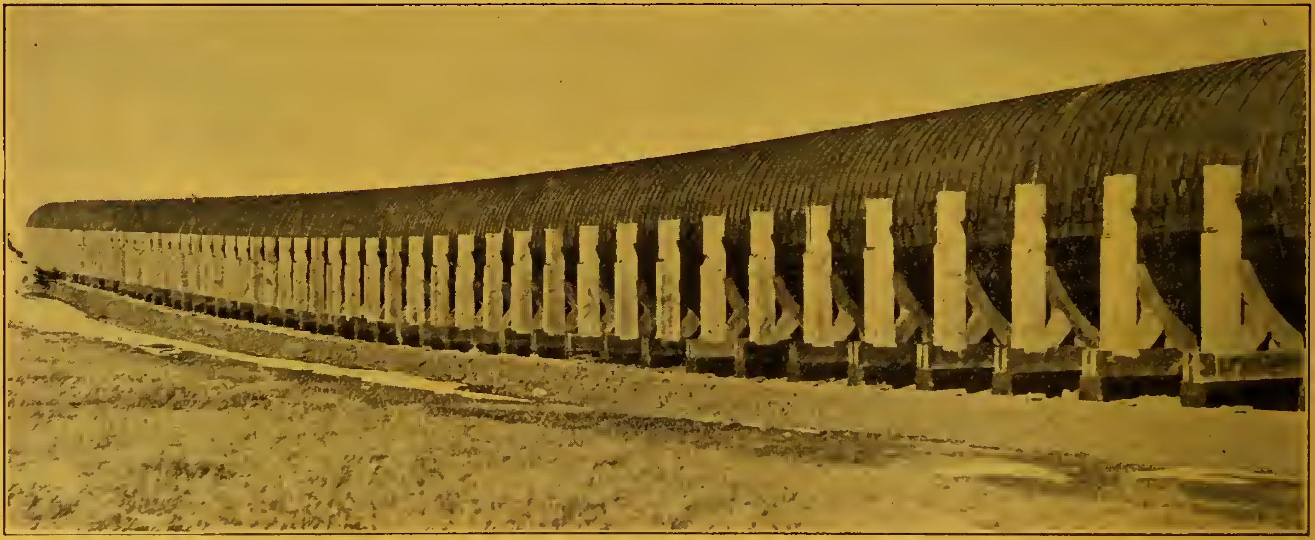
DURABILITY!

Double
Burlap Jacket
secures permanency
in all soils

TWO MILES of GOOD PIPE for the PRICE of ONE

Those who cling to the theory that a combination of efficiency and durability is possible only with Metal Pipe at a fancy price, have not fully investigated the improved standard of Wood Pipe. RESULTS in several Western Municipalities are most convincing.

WIRE-WOUND WOOD STAVE PIPE
CONTINUOUS STAVE PIPE
WOODEN TANKS
SILOS



.Continuous-Stave Pipe, 10½ feet in diameter, built by us for Lethbridge Northern Irrigation District (Alberta)

Let us quote on your requirements—Catalogue forwarded on request.

CANADIAN PIPE COMPANY, LIMITED

550 Pacific St., VANCOUVER, B.C.

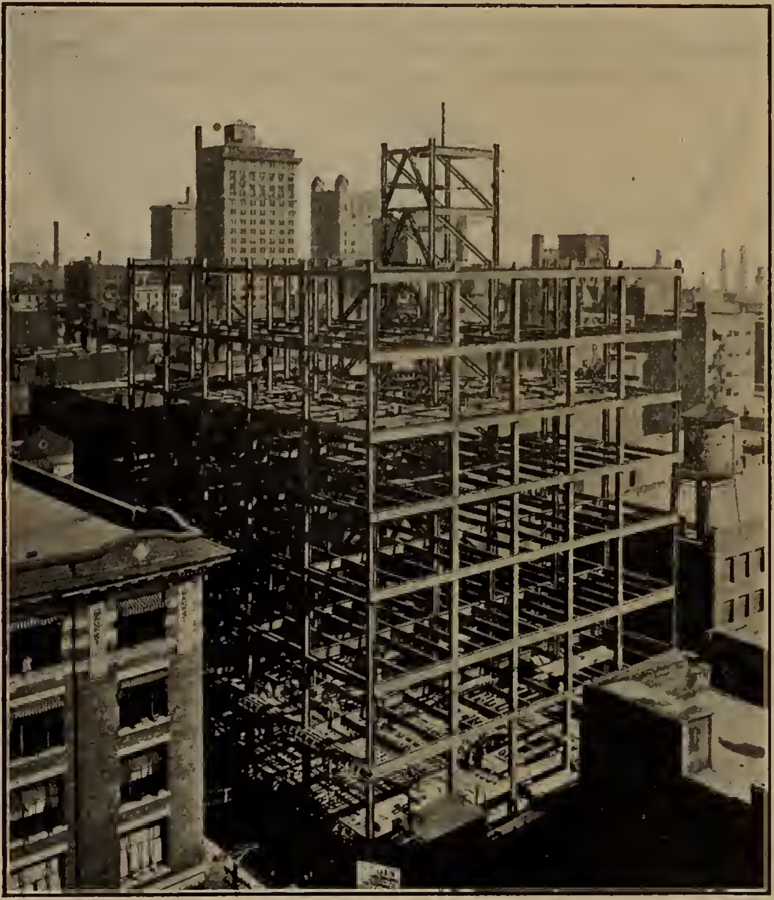
The largest cities in the world construct their sewer systems of Vitrified Clay Pipe. Those that have tested substitute materials most extensively have returned to the use of Vitrified Clay Pipe exclusively because it has proven to be the most permanent, and therefore the most economical material.

Performance is better than promise

Vitrified Clay Pipe Publicity Bureau. 9 Wellington St. East, Toronto
St. Johns, P. Q. New Glasgow, N. S.

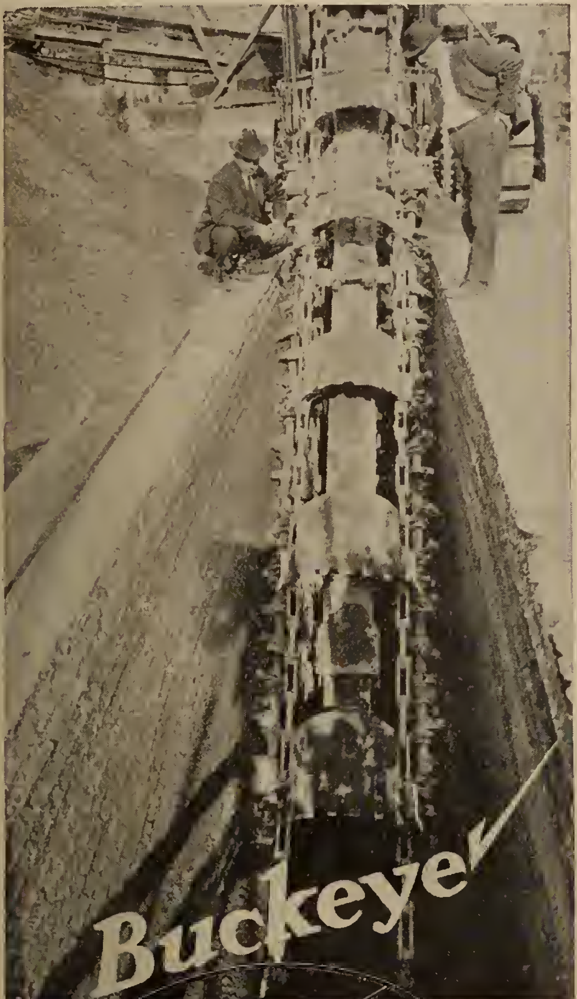
Record of Performance is the Best Advertisement

The structural steel framework for the new Bell Telephone Co. Building, Toronto, is shown herewith. In the background of the illustration may be seen four of the largest buildings in the British Empire, the King Edward Hotel, the Royal Bank, the C. P. R. and Dominion Bank Buildings, all of which are monumental tributes to the world-wide record of structural steel.



BUILD WITH STRUCTURAL STEEL

Issued by the
Structural Steel Association



A Buckeye Cuts Nearly Any Width

A dream that is now a reality. A cutting range that makes it possible to dig trench of practically any desired width with only one Buckeye.

The new Rotary Auxiliary Cutter gives the C-10 a range from 24 to 44 in., the C-15, from 24 to 60 in., the C-20, from 40 to 76 in.

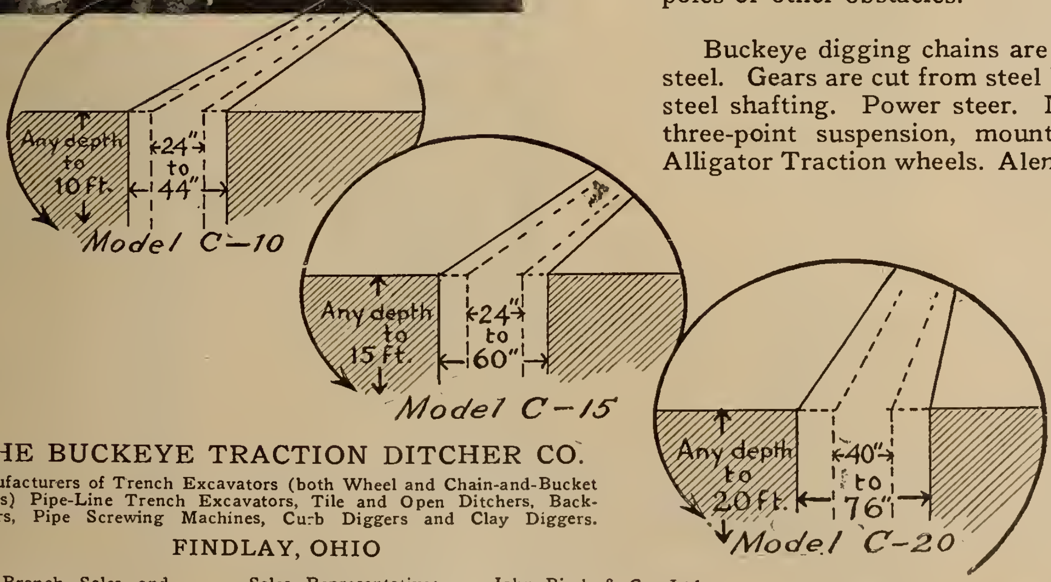
Any width within these wide limits. The cutting width is adjustable—in a few hours the change is made—and your Buckeye is ready to go.

When you buy a new Trencher, be sure to have this advantage.

Many Buckeye Features

When you want to shoot the dirt out the other side, the Buckeye Quick Shift Conveyor gives instant change of delivery. A big advantage when the trench runs close to trees, poles or other obstacles.

Buckeye digging chains are special electric steel. Gears are cut from steel blanks. Chrome steel shafting. Power steer. Main frame has three-point suspension, mounted on Buckeye Alligator Traction wheels. Alemite lubrication.



Let us show you why Buckeyes dig big yardage in any soil — and do it year after year. Send the coupon—no obligation.

THE BUCKEYE TRACTION DITCHER CO.

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types) Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

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Chatham, Ontario

Sales Representative:
The General Supply Company of Canada, Ltd.
85 Water Street
Winnipeg, Manitoba

John Birch & Co. Ltd.,
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London, E. C. 2, England

You'll always be glad you bought a **Buckeye**

THE BUCKEYE TRACTION DITCHER COMPANY
Findlay, Ohio

Tell me all about Buckeye
Excavators Back-Fillers

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- Drills
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co.
  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
  - Canadian Equipment Co.
  - Dominion Bridge Co., Ltd.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

(Continued on page 8)

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Why?

Because it is efficient, economical and easy to use. The facts are yours for the asking.

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"THE NATIONAL BITUMEN"

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Sturtevant, B. F. & Co.

Electrical Specialties
Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

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Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

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American Enameled Brick & Tile Company

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Canadian Ingersoll Rand Co.
Clyde Iron Works
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roi Company
Sterling Engine Co.
Waterous Engine Works Co.

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Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

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Engineering & Machine Works of Canada Ltd.
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Hopkins & Co., Ltd., F. H.
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Lumsden Engineering & Contracting Co.
Mussens Limited
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Canadian Blower & Forge Cr
Jeffrey Manufacturing Co.
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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

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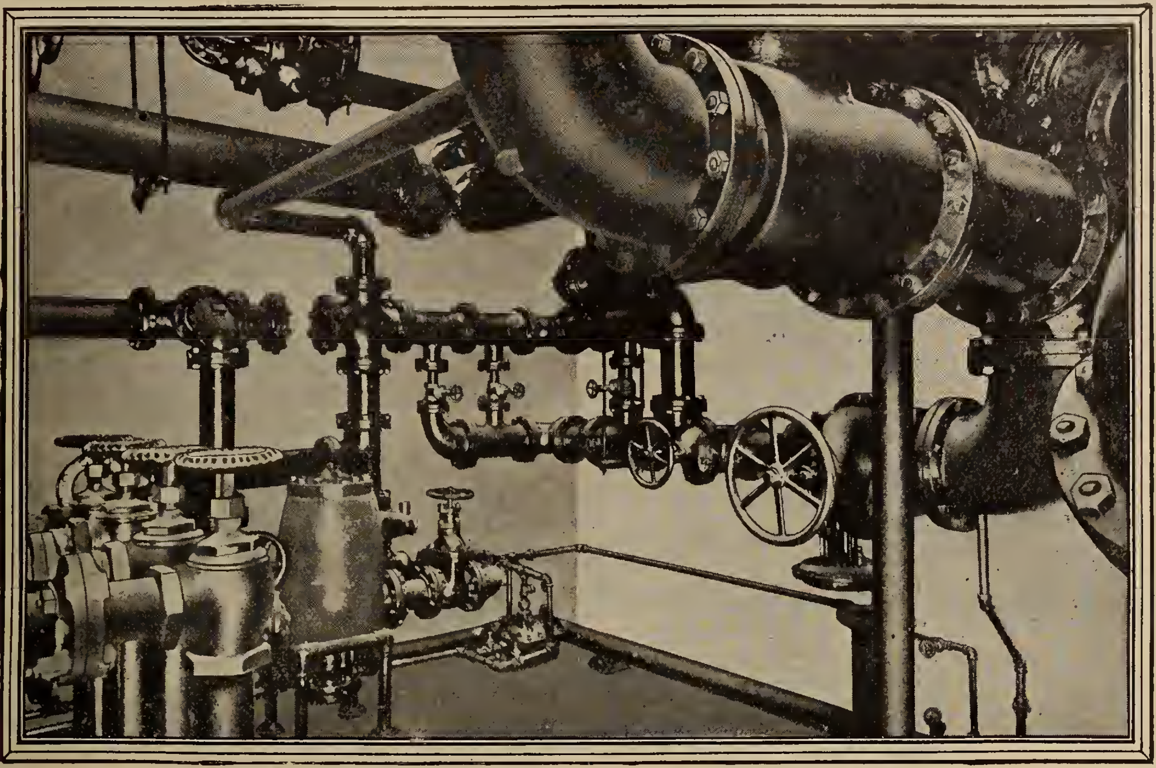

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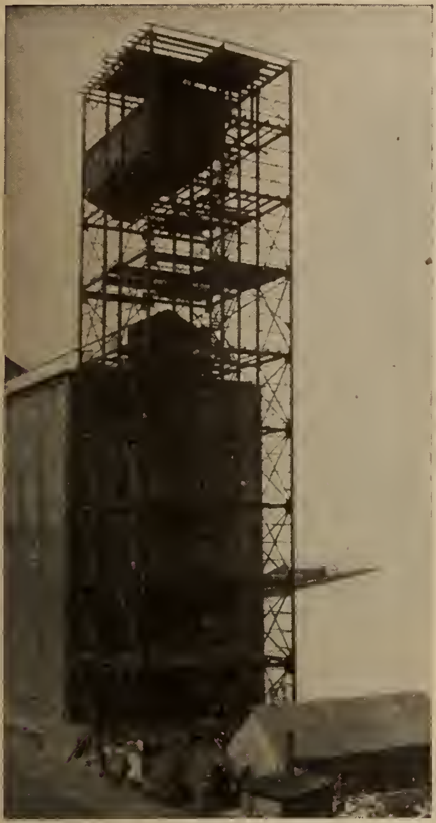

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Engineers, Manufacturers
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Prompt Delivery

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The requirements of modern traffic are best met by highways of modern construction—built for permanence with concrete. The known ability of this modern material to resist climatic conditions and heavy traffic together with the reduction in motive power costs it ensures, explains the rapidly increasing mileage of permanently paved Canadian highways.

Highways of concrete require very little upkeep. They lighten the taxpayer's burden and reduce haulage costs. Farmer and consumer alike, feel the benefit of this and the whole community is helped by the tourist trade such highways invite.

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Uniformly Reliable

CANADA CEMENT
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FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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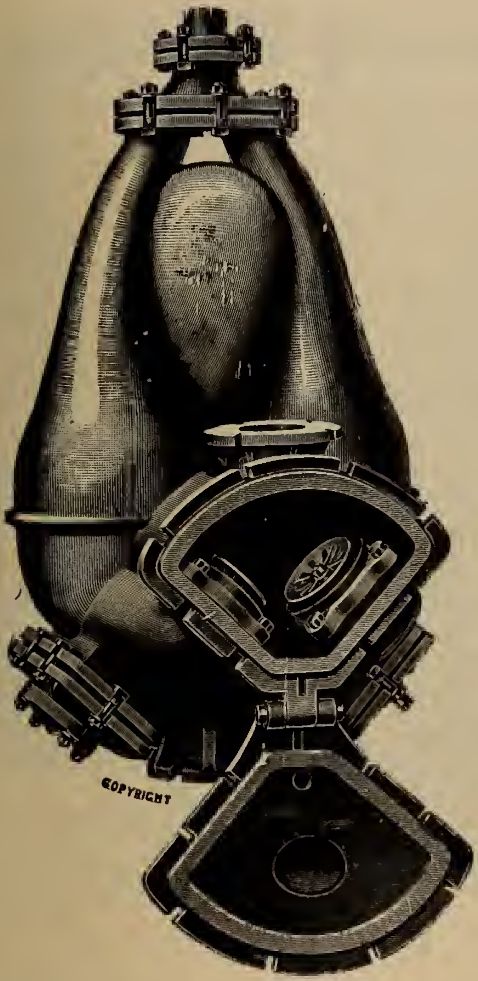

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Genuine English Pulsometer Pumps

They work anywhere—Just sling them on a rope or chain—Connect the steam pipe, that's all—It will do the rest. No engine to take care of.

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Double Acting—Rapid stroke for steam or air.

Drives the Piles and Pulls Them

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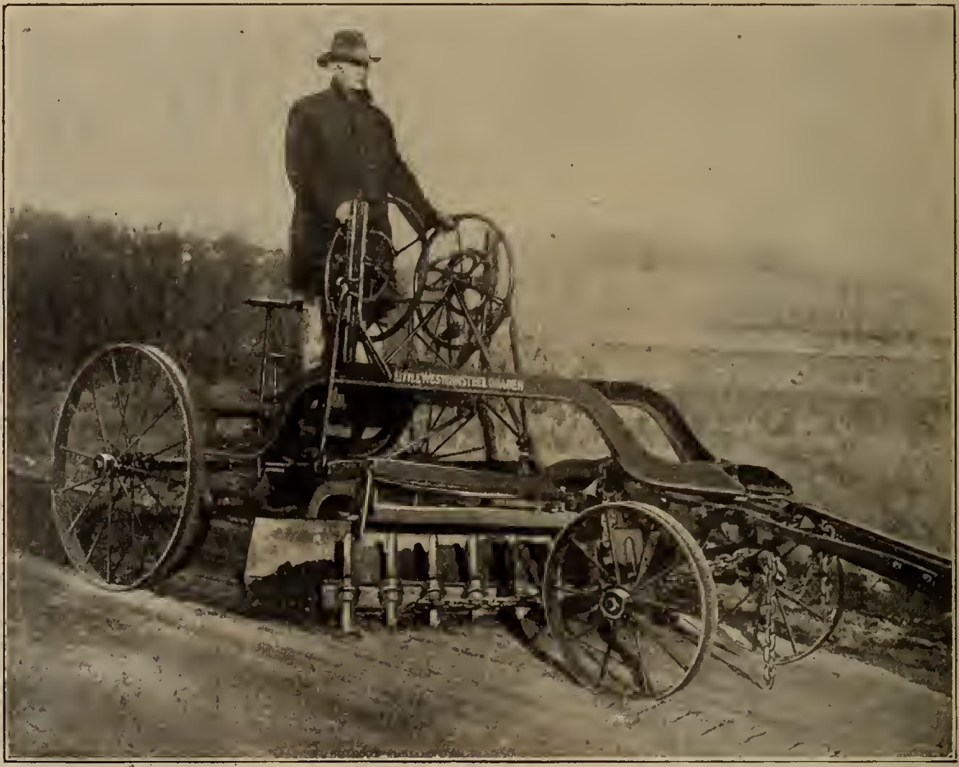
Canada's Gravel Roads Need This Maintainer



Little Western Road Maintainer

Here is a practical **Road Maintainer** which is just the thing to keep the gravel roads of Canada in good condition. The **Little Western Steel Grader** does not need our commendation, its worth having been proved on thousands of roads. This new road maintainer is merely a **Little Western Grader** fitted with an adjustable scarifier attachment which can be moved out of the way entirely when not needed.

Gravel roads are too hard to be worked with a blade only, except immediately following a rain. By using a Little Western maintainer the scarifier loosens the surface for the blade to handle and makes it possible to fill the cups and ruts economically.

Let us tell you all about this practical road maintainer.

SUCCESSFUL PERFORMANCE FOR A.G.C. of A.

Western
That's Why

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

Stock carried at our warehouse at Toronto for the convenience of our customers

MUSSENS M LIMITED

"I wish to take this opportunity of telling you how satisfied I am with this Shovel"

Writes S. H. Stryker, of Stryker & Stryker,
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"We purchased [redacted] at the same time we bought the 20-B and up to date my expense for parts on the Bucyrus has been only $3.40, while the cost of similar parts on [redacted] has been $108.00 for the same period of time. As to the yardage of each respective shovel, can say that the Bucyrus can, and has done, at least 12½% to 18% more yardage per day. Candidly the general condition and appearance of the Bucyrus is excellent after seven months' continuous work, never having been stopped a minute for any cause except weather."

THERE ARE REASONS Why 20-B Owners Feel This Way—Here Are a Few of Them:

1. **The 20-B is Faster**— Its box girder-type boom and outside dipper sticks are lighter and stronger, and because of better balance, are easier to swing. Furthermore, the two-part hoist overhauls and hoists faster.
2. **The 20-B is Stronger**—Built to Bucyrus standards throughout—the underframe is of heavy structural steel, built around a big center casting, the most reliable construction known.
3. **The 20-B is Simpler to Operate**—An improved 3-lever control—a comfortable seat for the operator. Same lever for throttle and ram—load may be lowered with release throttle without foot brake.
4. **The 20-B has Better Caterpillars**—Less parts than any other built—stronger, longer life. A power steer operated from operator's seat or from ground.

Your Trucks Move Faster Under a 20-B

BUCYRUS
Small Revolving Shovels are built in following sizes:
20-B—¾-yard.
30-B—1, 1¼-yard.
50-B—1¼ to 2-yd.
Also as Draglines, Clamshell Excavators, Cranes, Etc.

SEND FOR BULLETIN
C-D
AND STATE WHICH SIZE YOU ARE INTERESTED IN

BUCYRUS
Established in 1880
A Special Plant Devoted Exclusively to Small Revolving Shovels
Railroad Type and Revolving Shovels of all sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

538

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NATCO FLAT ARCH CONSTRUCTION

Table of Safe Loads (Weight of Arch Deducted)
Pounds per Square Foot

The weight of the arch has been deducted from safe loads in table below, so that only the dead load of concrete fill, plastering, etc., must be deducted to obtain the net safe live load for any arch and span.

Arches	8 inches	10 inches	12 inches
Spans, Feet and Inches	Pounds	Pounds	Pounds
3-0	735	1084	1487
3-6	531	785	1083
4-0	399	593	820
4-6	309	461	640
5-0	244	367	511
5-6	196	297	416
6-0	159	244	344
6-6	131	203	287
7-0	...	170	243
7-6	...	144	206
8-0	...	...	177
8-6	...	...	153
9-0	...	...	132
Weight of Arch, Sq. ft.	36	40	46

MEANS
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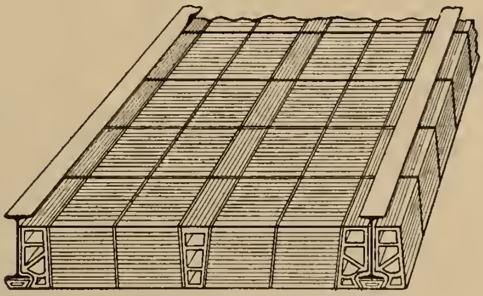
- Simplicity of Design
- Sound Proof Buildings
- Fireproof Construction



Typical NATCO Flat Arch, the accepted type of Standard Fireproof Construction

The co-operation of our Engineering Department is at all times available in helping to solve your building problems.

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OF CANADA, LIMITED

Factory: HAMILTON -:- **Dominion Bank Building, TORONTO**

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S. Pearson & Son, Ltd., of London, one of the largest contracting firms in the world, are building an enormous dam across the river Nile to provide a base water supply in the Sudan and are also building 650 miles of irrigation canals. In beginning this great project, the Engineering Department of S. Pearson & Son, Ltd. was confronted with the almost insurmountable task of transporting machinery, fuel and supplies under extreme difficulties of soil and climate, and in a country where roads do not exist

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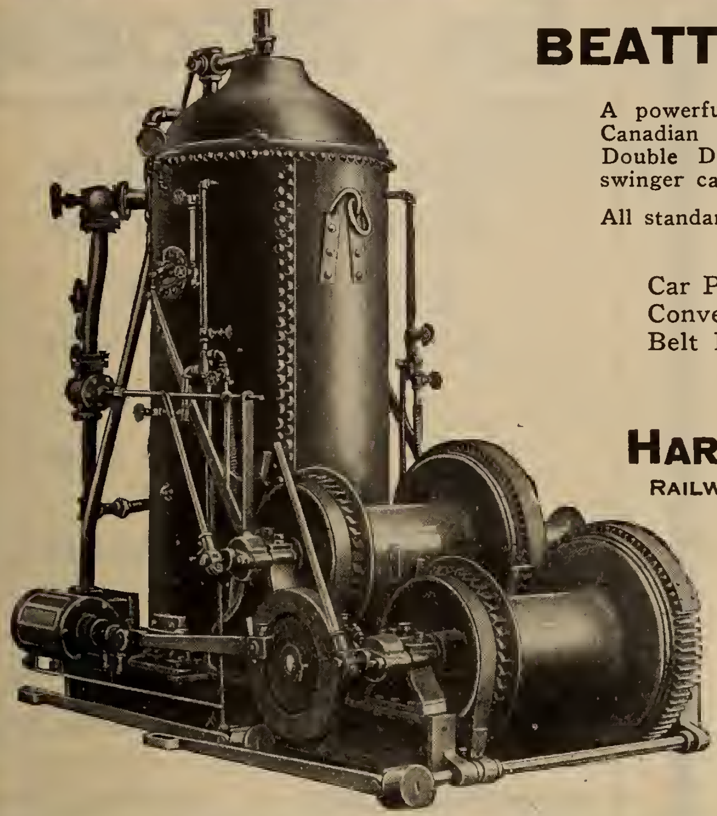

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A powerful and economical steam hoist built by Canadian Mead-Morrison Company. Single or Double Drum. An additional third drum and swinger can be added at any time.

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"Fuller & Johnson Model N"—that's a name contractors and engineers recognize as applying to a simple, sturdy, dependable, easy-to-start engine—an engine built to fill the particular needs of the construction field.

Let us send you a generously illustrated descriptive catalog, telling all about this Model N Engine.

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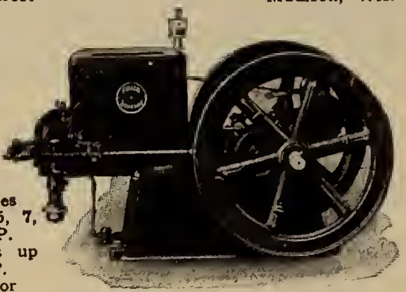
111 Cedar Street Madison, Wis.



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Stationary or Portable

The Engine for the Contractor

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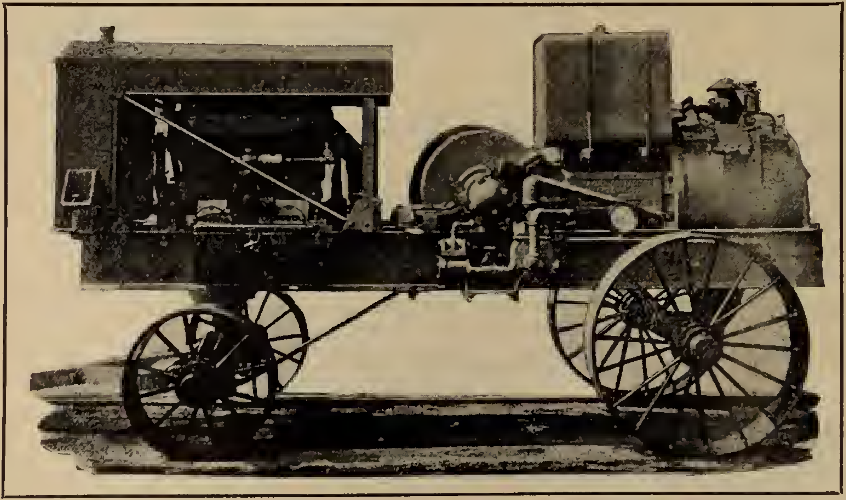
P. O. Box 792

Municipal Engineers! The City of New York is rebuilding sewers from the inside and avoiding the cost and difficulty of tearing up the streets. So is St. Louis, Mo., Dayton, Ohio, and many others. They are doing it with the equipment illustrated below. Write us for details of this work. We'll show you how to make a better job and also save money.



Taylor 13 in. x 8 in. Portable Gasoline Compressor

N-1—"Cement-Gun"

The "Cement-Gun" is not a restricted article. It may be purchased outright and used by anyone.

Cement-Gun Company Inc.
ALLENTOWN, PA.
New York Chicago Pittsburgh Los Angeles Seattle
Agents in Eastern Canada: General Supply Company of Canada
356 Sparks St., Ottawa. Foreign Agency: International Cement-Gun Co., Ziest, Holland

THE "LEYNER" SHARPENER FILLS CONTRACTORS' NEEDS

August 1, 1923

Gentlemen:

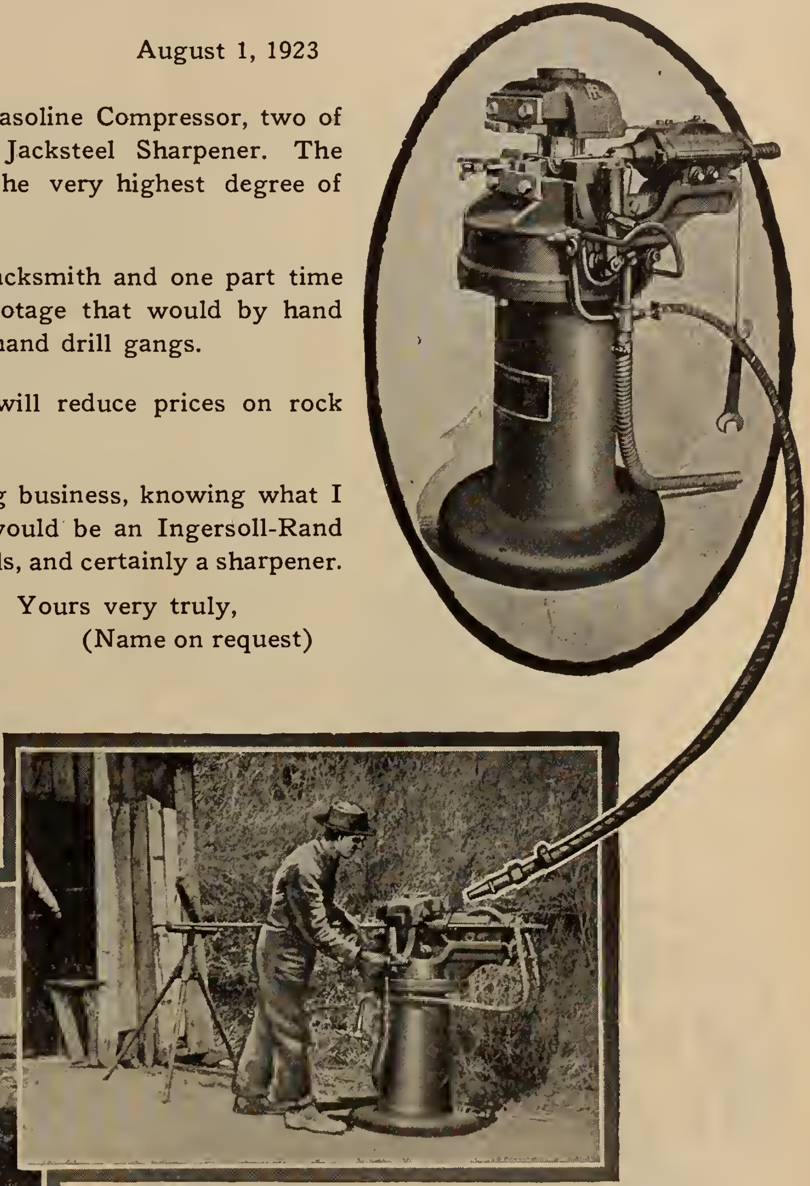
We have at Ely your 8 x 8 Portable Gasoline Compressor, two of your DCR-23 Jackhamers, and a No. 33 Jacksteel Sharpener. The equipment and your service are giving the very highest degree of satisfaction.

Operating with two drill runners, a blacksmith and one part time compressor attendant, we are drilling a footage that would by hand require 90 men, operating as 30 three man hand drill gangs.

These "Imperial" Compressor outfits will reduce prices on rock work all over.

Were I again to start in the contracting business, knowing what I now do, the first equipment I would buy would be an Ingersoll-Rand Portable Gasoline Compressor outfit with drills, and certainly a sharpener.

Yours very truly,
(Name on request)



Canadian Ingersoll-Rand Co.
Limited

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For the U. S. refer Ingersoll-Rand Co., 11 Broadway, N.Y.

"Leyner" sharpeners pay their way even where only one or two drills are used. Ask for bulletins.

Ingersoll-Rand

"Mr. Dealer, Meet one of your star salesmen ---the Fire Chief!"

The Ontario Gypsum Co. Ltd.,
Paris, Ont.

Kitchener, Ont., Canada, October 14, 1922.

Gentlemen :-

"I received the samples of Gypsum Board and Gyproc sent me by your Company. Please accept my thanks for same. I will do my best to have these materials used in building in our city.

Your fire test of the above products was a real demonstration of the necessity of Fire Proof Buildings in every City, Town and Village in the Dominion of Canada, and I would not hesitate in recommending your products in all classes of buildings."

Yours very truly,
(Sgd.) H. Guerin, Chief, Fire Department.

CANADA'S FIRE CHIEFS do not let their duty to the public end with the putting out of fires. They believe in, and practice, the "ounce of prevention." When they know a device or product that guards life and property, they do not hesitate to recommend its use.

Hence the above letter which is just typical of many we are constantly receiving from fire chiefs throughout the Dominion.

Do you realize, Mr. Building Supply Dealer, what effect the Fire Chiefs are having on the purchases of the home owner, the builder, architect and others? From the flimsy, dangerous lath and plaster of a few years ago, these people, your customers, are changing to the modern, efficient GYROC and other Gypsum products.

Are you getting your share of this business by handling Gypsum Products, or are you forcing them to purchase elsewhere?

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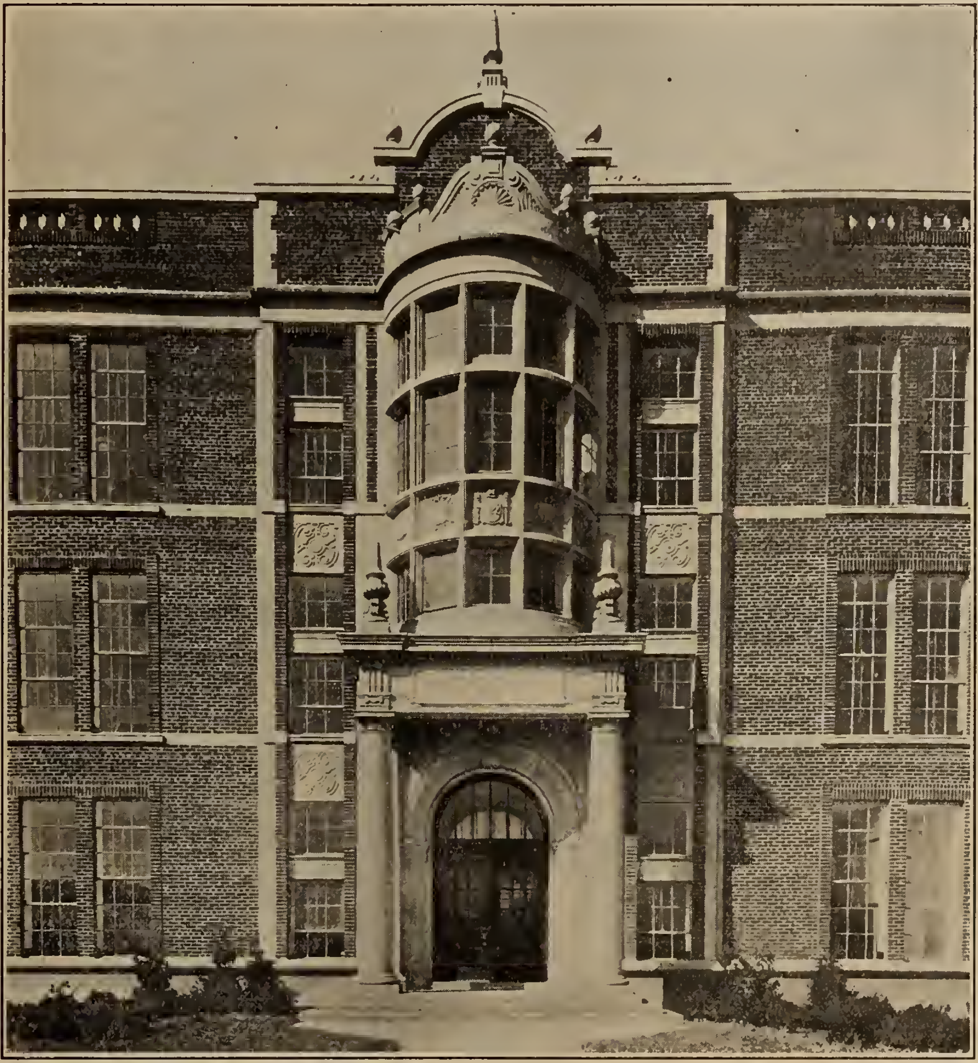
The Ritchie Cut Stone Co. Ltd.

Specializes in High-class Work, at Moderate Prices

HERE IS A SAMPLE



The main entrance feature to the W. H. Ballard School, Hamilton, Ont.
P. H. Secord & Sons Construction Co., Ltd.—Contractors Warren & McDonnell—Architects

We carry a large stock of INDIANA LIMESTONE and will be glad to quote on any plan.

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THE RITCHIE CUT STONE CO. LTD., HAMILTON, ONT.

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WE THANK YOU FOR PAST BUSINESS AND ASSURE YOU THAT YOUR FURTHER ENQUIRIES AND ORDERS WILL RECEIVE OUR PROMPT AND PERSONAL ATTENTION.

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NOVEMBER, 1923 TELEPHONE NOS. { ELGIN 1780 / ELGIN 1620

Banish Disease Spreaders from Your City

The dust-raising, germ-spreading, horse-drawn street cleaner is a menace to public health.

The **Austin Pick-up Motor Sweeper** safeguards the health of your city and will show a definite saving in street cleaning expense.

Really valuable information and catalogues will be mailed on request.

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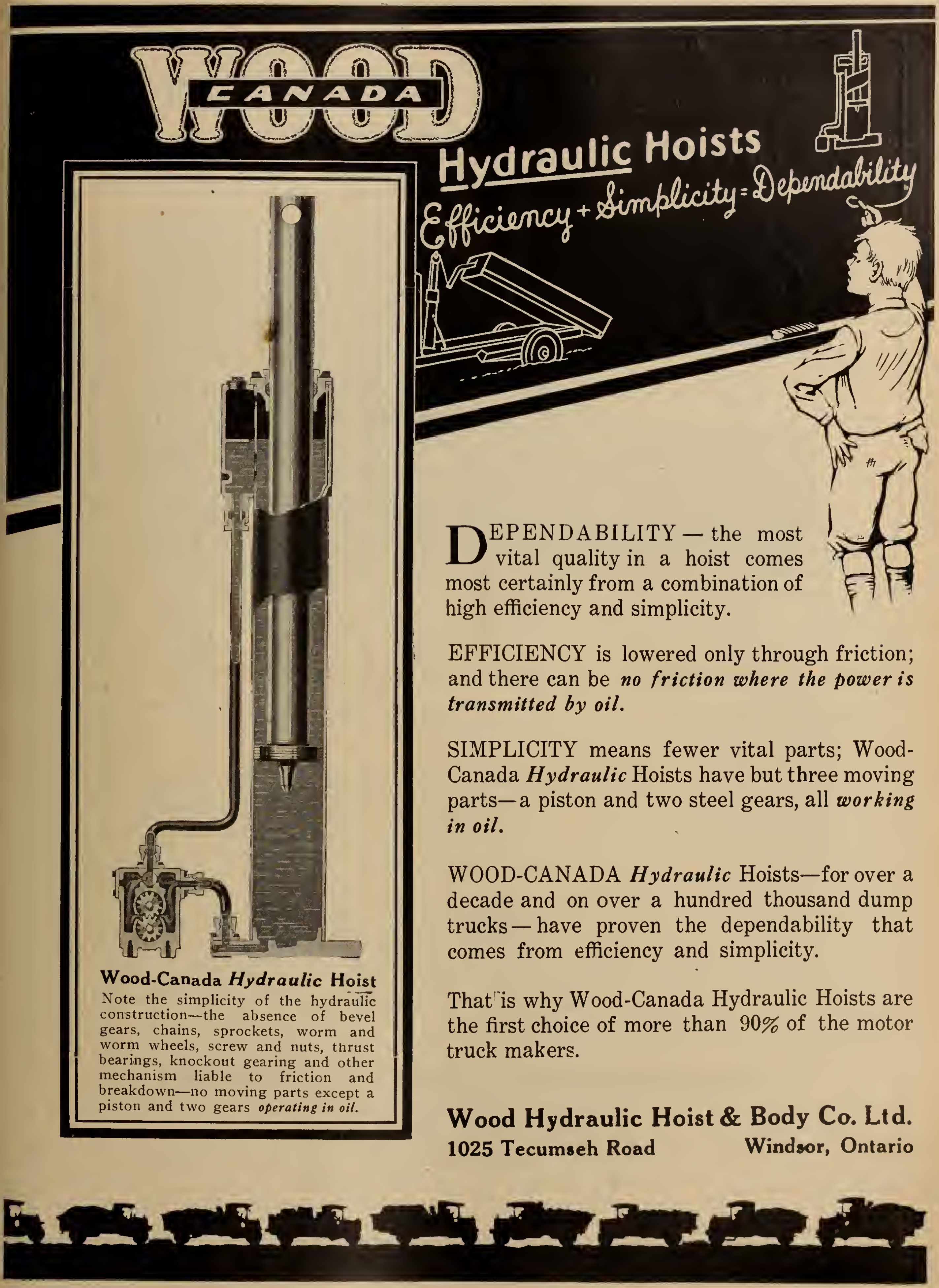

Wood-Canada *Hydraulic* Hoist

Note the simplicity of the hydraulic construction—the absence of bevel gears, chains, sprockets, worm and worm wheels, screw and nuts, thrust bearings, knockout gearing and other mechanism liable to friction and breakdown—no moving parts except a piston and two gears *operating in oil.*

DEPENDABILITY — the most vital quality in a hoist comes most certainly from a combination of high efficiency and simplicity.

EFFICIENCY is lowered only through friction; and there can be ***no friction where the power is transmitted by oil.***

SIMPLICITY means fewer vital parts; Wood-Canada *Hydraulic* Hoists have but three moving parts—a piston and two steel gears, all ***working in oil.***

WOOD-CANADA *Hydraulic* Hoists—for over a decade and on over a hundred thousand dump trucks—have proven the dependability that comes from efficiency and simplicity.

That is why Wood-Canada Hydraulic Hoists are the first choice of more than 90% of the motor truck makers.

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Seventeen Otis-Fensom service offices, extending across Canada, each assigned a definite district, are available to **every** elevator owner regardless what make of elevator is installed in his premises. The personnel of these seventeen service offices is exclusively Otis-Fensom, trained in our own factories, equipped from every standpoint to handle the simplest or most complex problems common to vertical transportation of all kinds. Any work undertaken by the individual offices entails the support and co-operation of the entire Otis-Fensom organization to a successful fulfillment.

Accessories, supplies and parts are stocked at convenient points ready for immediate shipment, insuring quick delivery.

This is the only service of its kind in the Dominion of Canada.

Full explanation of this service upon request.

OTIS-FENSOM ELEVATOR COMPANY
LIMITED
HEAD OFFICE: 170 BAY STREET
TORONTO

Contract Record and Engineering Review

Devoted to Construction and Engineering

Vol. 37 Toronto, November 28, 1923 No. 48

24,000 Cu. Yds. of Cofferdam Blown Out in Two Shots with 56,000 lbs. of Explosive

Removal of 1100 ft. of Dam Surrounding Site of New River Channel Adds 9½ ft. to the Head of the Great Falls Power Plant on the Winnipeg River

Some very interesting construction work has been carried out in connection with the Great Falls power development of the Manitoba Power Co. on the Winnipeg river. The nature of the scheme was thoroughly explained in the Contract Record of April 26, 1922, page 372, but to briefly review its salient features, it might be explained that the power house proper is located at Island No. 2, (see accompanying map) where the dam will hold the head waters above the power house at Elevation 808, thus forming a pond or peak load reservoir of approximately 2,000 acres in extent, providing a deep, wide and extensive body of water reaching upstream a distance of five miles and flooding out the existing rapids, thus obviating the trouble so often experienced in these northern latitudes from frazil ice, which forms in swift, turbulent water. This dam at Island No. 2 raises the water level by forty-six feet. The reach of the river below the power house was from thirty to ninety feet in depth, this level being maintained by a rock reef across the river at White Mud Falls 2½ miles below the power house. By excavating a channel through this reef, the entire reach of the river between White Mud Falls and the power site was lowered about ten feet, thus making a total operating head of fifty-six feet, for which head the turbines are designed.

The construction of this channel was an interesting job, to a description of which the following paragraphs are devoted:

The concluding work in connection with the project was the removal by a charge of explosives of the cofferdams surrounding the site of the channel. The diversion of the entire flow of the river through this channel has increased the operating head on the Great Falls plant by lowering this entire lake level 9½ feet. The channel as excavated is 200 feet wide, 2,200 feet long and varies in depth from 5 to 30 feet below the original rock surface. Approximately 200,000 cubic yards of rock were excavated and used for constructing the main dam at Great Falls.

When work was initiated 18 months ago the site of this channel was enclosed by cofferdams composed of timber cribs, filled with rock and sheathed on the outside, and made securely watertight by a clay toe-fill. The entire enclosure was then pumped out and the excavation carried on behind this protecting dam.

52,000 Lbs. of Dynamite Exploded

On October 12th the work of excavating and clearing up the channel had been completed and the cofferdams at the upper and lower ends of the channel were undermined and heavily loaded with dynamite, so placed that on firing the charge the entire structure would be completely demolished. At midnight on that date the pumps were shut down and the area within the enclosure was allowed to fill with water. When sufficient water had entered the enclosed area to thoroughly tamp the explosives the work of dismantling the pumps, removing water pipes, air lines and other construction equipment was undertaken. This work was completed by 2.00 p.m. on October 15th, and all of the men employed on the work, with the exception of those detailed to fire the charge, entrained for Great Falls. Messengers were sent throughout the neighborhood to warn all settlers of the time of the explosion of the charge and whistles were blown continuously until the camp was cleared. When everything was in readiness for the blast a warning shot was fired and five minutes later, at 2.45 p.m., the charge of 14,000 pounds of dynamite was fired, completely removing the down stream cofferdam for a distance of 600 feet, containing a volume of over 4,000 cubic yards of broken stone, heavy timber and clay fill.

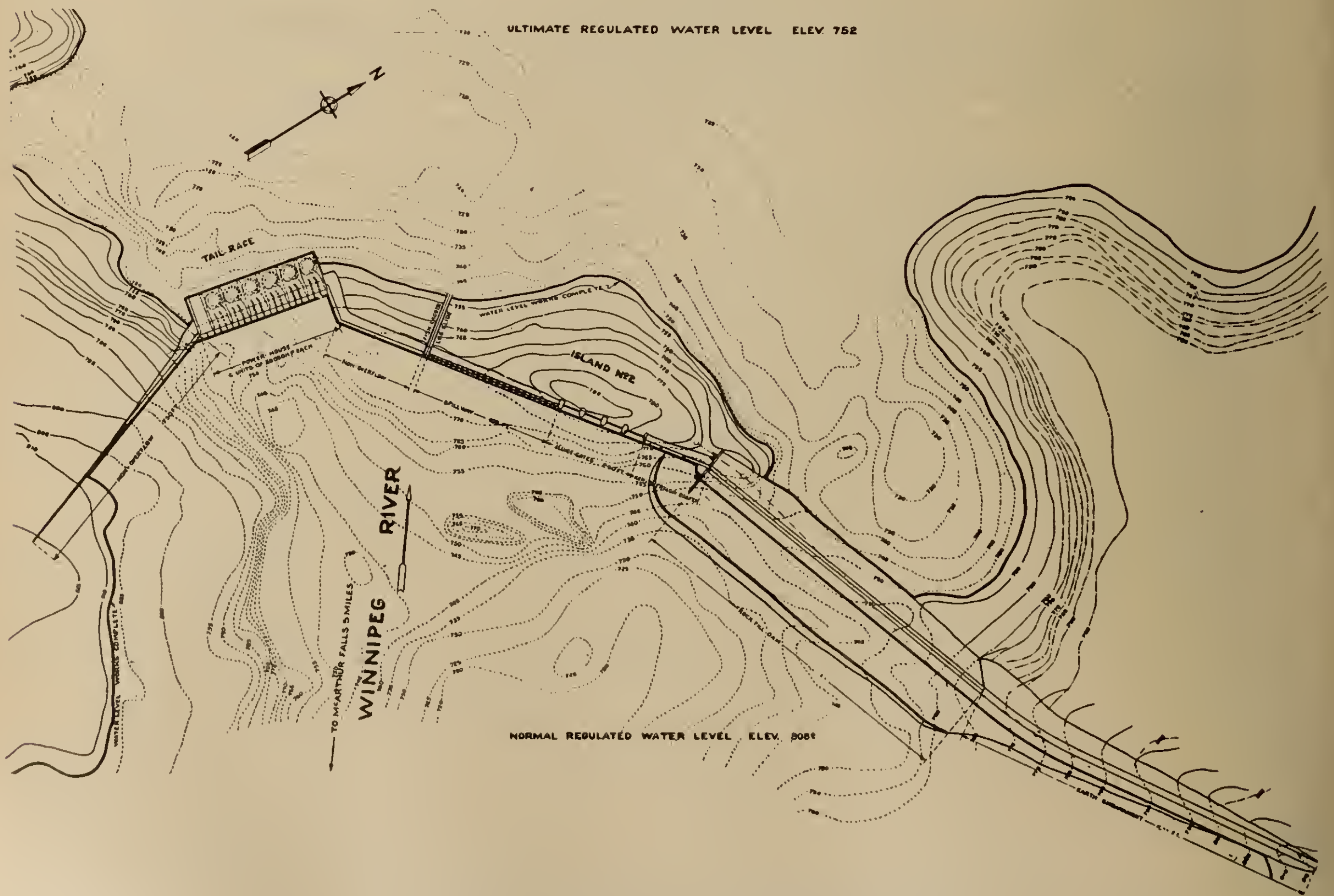
Immediately after this shot was fired a complete inspection was made of the wiring for the charge of the upstream cofferdam, and a second warning given to those in the vicinity. At 3.35 p.m. a warning shot was fired and at 3.40 p.m. the switch was closed, exploding 38,000 pounds of dynamite and 4,000 pounds of black powder, completely removing the upstream cofferdam for a distance of 500 feet, containing a volume of 20,000 cubic yards of rock, heavy timber and clay fill, reaching in places a depth of 40 feet.

A downstream view of the power house

Permanent Works Nearly Complete

With the firing of the charge under the cofferdam the river was free to flow through the newly formed channel and by 7 o'clock the following morning this entire stretch of river had been changed, the level having been lowered 9½ feet.

With the construction of the White Mud Falls channel the permanent works, comprising the whole scheme of development, was practically brought to completion.


ULTIMATE REGULATED WATER LEVEL ELEV. 752
N
TAIL RACE
POWER HOUSE
ISLAND Nº2
WATER LEVEL WORKS COMPLETE
NON OVERFLOW
SPILLWAY
SLUICE GATES
RIVER
WINNIPEG
TO McARTHUR FALLS 5 MILES
ROCK FILL DAM
NORMAL REGULATED WATER LEVEL ELEV. 708

General layout of dam and power house, Manitoba Power Co.

New Railway Viaduct Scheme for Toronto

Canadian Pacific and Canadian National Railways Propose a Modified Plan for Grade Separation—Cost Considerably Lowered and Time of Completion Reduced

At a conference on November 16, between Canadian Pacific and Canadian National Railway officials and the board of control, harbor commissioners and board of trade, of Toronto, Ont., a new scheme for the solution of the city's waterfront railway problem was submitted by the railways. This plan differs somewhat from the one to which all parties agreed in 1913, and which was never consummated owing to the war and the lack of finances since the war.

Under the agreement of 1913 a viaduct across the front of the city was to have commenced a little east of Bathurst street and to have extended to Logan avenue on the east, with bridges at John street and Spadina avenue and subways under the other streets.

Under the new proposal, on which the city representatives refused to commit themselves pending the receipt of detailed plans, the viaduct west of Yonge St. is eliminated and from that street it rises on a one per cent. grade to the east until the level under the old viaduct order is reached at Jarvis street, from which point it will proceed east as originally planned to Logan avenue.

The details as to bridges and subways are as follows: Bathurst street, tracks on level, old bridge; Spadina avenue, tracks on level, old bridge; John street, tracks on level, old bridge; York street, overhead bridge; Bay street, overhead bridge; Yonge street, overhead bridge; Scott street, no provision, street apparently closed; Church street, subway; Jarvis street, subway; George street, no provision, apparently closed; Frederick street, subway; Sherbourne street, no provision, apparently closed; Princess street, subway; Parliament street, subway; Trinity street, subway; Eastern avenue, subway; Queen street, subway; Logan avenue, no provision.

The only modification west of Yonge is a rise of four feet to get into the station to permit the passengers in the station to get under the tracks and also to facilitate drainage.

The total cost under the new plan is estimated at $20,476,000 as compared with $34,000,000 under the old plan, according to M. H. McLeod, consulting officer to the executive of the C. N. R. who outlined the scheme at the conference. The city pays under the new plan, he said, $4,213,683 as compared with $8,846,404. The total saving by the railway companies would be between eight and nine million dollars.

Mr. MacLeod said that the terms as to the width of the bridges and subways were a matter for further negotiation. No provision was made at the streets not designated for bridges or subways on account of their proximity to other streets where protection was provided by means of subways.

Sir Henry Thornton, president of the Canadian National Railways, in introducing the subject made it plain at the outset that the railways were not present to call into question the validity of the viaduct agreement." We reiterate what we said in the signed statement already made public," he said. "We are here to discuss in a kindly and serious fashion a scheme which in my judgment and in the judgment of Mr. Beatty is a more satisfactory solution than any yet proposed. In a scheme of such magnitude it is seldom possible to hit upon a solution in a short time. In the lapse of months points of view change and ultimately you come to a different conclusion than that arrived at originally.

"I should be wanting in good faith and in common sense if I failed to draw attention to something that I think would be better.

"There are some aspects of the plan which are worthy of note. It will involve a saving to the city of about $4,600,000, and between eight and nine millions to the railway companies. How much store you must set upon that statement must rest with the city to decide. You know your resources better than I. So far as the C. N. R. is concerned the question of capital cost must play a large part in our mind. You know our condition. You know that we are struggling to improve our financial position, and if we are successful in lightening the burden to the taxpayer I must scrutinize any matter involving expense, and if there can be evolved a cheaper scheme I must give that great and serious consideration."

Mr. E. W. Beatty, K.C., president of the Canadian Pacific Railway Co., confirmed the stand taken by Sir Henry.

He stated in part:

"The original agreement provided that the portion of the cost to be borne by the city should be based upon the cost of the viaduct to be constructed under the original plans, the total of which was $13,000,000 and if the parties failed to agree as to what this proportion was, that it should be determined by the Board of Railway Commissioners. I mention this fact only for the purpose of indicating that there has been no determination yet of what the city's proportion is, either in percentages or in dollars and cents.

"At the time the agreement was made, the estimated cost of the two companies, including the new Union Station, was between twelve and thirteen million dollars and these costs were submitted to the directors and I think the shareholders of the two corporations when the approval of the agreement by them was obtained.

"I mention the question of costs because it was one of the factors which was before the Railway Board when considering the most desirable form of grade separation on the waterfront. In fact, costs and method of grade separation are inseparable and at the time the scheme was approved the costs bore such a moderate proportion to present-day costs because it undoubtedly influenced the minds of the Commissioners in determining what the proper solution should be. The companies have been severely criticized by the other parties to the agreement because the work has not been carried out, but I am quite frank in saying to you that there has not to my knowledge ever been a time during which it could reasonably be commenced. Works of this magnitude, in view of the labor and material situation, were obviously impossible during the war and thereafter the position of the Grand Trunk Company was not such as would enable it to place its guarantee on any securities issued for the carrying on of the undertaking. With the acquisition by the government of this system, this disability is removed if parliament votes the necessary authority to the government to guarantee the securities or provides the government's proportion of the requisite funds.

"I have stated that we have been confronted with cost conditions which are, to say the least, abnormal, and I wish to emphasize that position from the standpoint of the general interests of the City of Toronto. We have made the most careful estimate possible of the cost of the whole work, and it approximates, including the station, thirty-six million dollars. That estimate includes certain arbitrary costs such as the value of lands to be taken, and damages. It does not include other items for wihch no approximation can possibly be made. By that I mean the cost to the railway companies of operating their train and conducting their ordinary traffic while the work is in progress.

"It is obviously impossible for a work of this size to be carried on without serious interruption to the traffic of the companies, and while this cost cannot be measured in dollars and cents, and is not a cost to which any interest contributes except the railway companies themselves, it will, in the opinion of the operating officers of both companies, run into figures of great magnitude.

Means Big Saving

"Therefore, gentlemen, the turn of the wheel has been distinctly to the companies' disadvantage and the effect of the war and after-war conditions has all militated against the companies' position. There is no inexhaustible supply of money for such purposes. In the last analysis, as public carriers, we must obtain our money from the people who will require to pay in traffic the interests on these expenditures. I am not in the fortunate position of my friend, Sir Henry Thornton, I have no powerful government backed by the credit of the whole nation to endorse my securities or pay my interest charges. In the case of the Canadian Pacific the obligations are direct and the amounts must be earned and ordinary charges paid or else the credit of the company is irreparably damaged, and I might as well frankly admit that I do not contemplate with any equanimity an enormous burden of this kind added to the already heavy obligations of the company."

Mr. MacLeod then explained the details of the scheme and answered questions. During the discussion it was intimated that the new proposal could be built in 10 months.

Gypsum Board for Electrical Installations

The Hydro-electric Power Commission of Ontario have approved of the use of Gyproc plaster board, 3/8 in. thick, for use in lining wooden cabinets and meterboards: This approval and recommendation is based upon the results of fire tests conducted at their laboratories, and places gypsum wall board upon a parity with asbestos board for fire protection of wooden cabinets and meterboards used in electrical installations. The recommendation has been approved by Mr. W. P. Dobson, laboratory engineer, Mr. W. C. Cale, assistant laboratory engineer, Mr. A. S. L. Barnes, secretary of the approvals committee and Mr. F. A. Gaby, chief engineer, all of the Hydro-Electric Power Commission of Ontario. This is another illustration of the high fire resisting properties of gypsum wall board.

No. 108

Canada's Engineers — D. W. Mill

Mr. David William Mill, who was some time ago appointed superintendent of surveys in the Department of Lands and Forests of the Province of Quebec, was born in 1879 in Maria Bonaventure County, P. Q.. He received his primary education at the College of Levis, P. Q., and subsequently under private tuition and at Laval University. In 1900 he successfully passed his examinations for the practice of land surveying in the Province of Quebec.

During the next ten years, from 1900 to 1910, Mr. Mill was engaged in the practice of all branches of his profession both on his own account and for the government. In 1910 he accepted the position of assistant to the surveyor-general and chief inspector of surveys for the Department of Lands and Forests, which position he held until a year or so ago when he was appointed superintendent of surveys for the same department.

Mr. Mill is a Colonial Fellow of the Surveyors' Institution of Great Britain; a member of the Professional Association of Engineers of Quebec, and an associate member of the Engineering Institute of Canada. He is also vice-president and examiner of the board of management of the Land Surveyors' Corporation of Quebec.

Mr. David Wm. Mill

Of Vital Interest to the Contractor

Standardized Sizes and Grades for Lumber

It is Anticipated that The Recommendations of a Strong Committee that Has Been Studying Lumber Production and Use Will be Accepted by the Industry

Contractors, house builders, engineers and architects, representing large consumers of lumber, will appreciate the efforts that are being made in the United States to standardize lumber sizes and grades. This movement is of as much interest to Canadian as to American lumber users, inasmuch as United States standards are accepted and adopted in this country and are virtually continental in their application.

Stimulated by the U. S. Department of Commerce, under Hon. Herbert Hoover, the lumber industry has been making a concerted effort to establish itself on a sounder, more economical, and less wasteful basis than formerly. In connection with this effort the standardization of sizes and grades and the development of methods of securing their observances are fundamentally important. To consider these problems of lumber standards and to formulate such specific recommendations as in its judgment are most practical, may be expected to be most effective in practice, and will best promote the objectives sought, a Central Committee on Lumber Standard was created as a result of conferences of representatives of the various manufacturing, marketing, and consuming interests.

With the aid and upon the advice of its Consulting Committee, including representatives of producers, distributors, and consumers, the Central Committee has formulated specific recommendations covering standard lumber classification, standard grade names and classifications, standard yard lumber sizes, method of lumber measurement, standard shipping weights and shipping and other provisions.

These recommendations have been submitted to Mr. Hoover who has arranged a conference on December 12 at which it is expected that the findings of the Central Committee will be ratified and given official status. While many of the proposals are of interest mainly to lumber producers and dealers, some have a bearing on the work of the contractor and engineer. For that reason they are brought to their attention in the following article.

The first recommendation has to do with lumber classification and this is arranged according to use, size and manufactured condition: According to use lumber is classified as (a) **Yard Lumber,** (b) **Structural Timbers,** and (c) **Shop** or **Factory** lumber. Different grading rules may apply to each class of lumber.

(a) **Yard Lumber:** Lumber that is less than six inches in thickness and is intended for general building purposes. The grading of yard lumber is based upon the use of the entire piece.

(b) **Structural Timbers:** Lumber that is six inches or over in thickness and width. The grading of structural timbers is based upon the strength of the piece and the use of the entire piece.

(c) **Shop** or **Factory Lumber:** Lumber intended to be cut up for use in further manufacture. It is graded on the basis of the percentage of the area which will produce a limited number of cuttings of a given minimum size and quality.

The classification according to size is as follows:

Yard Lumber

(a) **Strips:** Yard lumber less than two inches thick and under eight inches wide.

(b) **Boards:** Yard lumber less than two inches thick, eight inches or over in width.

(c) **Dimension:** All yard lumber except boards, strips, and timbers; that is, yard lumber two inches and under six inches thick, and of any width.

(1) **Planks:** Yard lumber two inches and under four inches thick and eight inches and over wide.

(2) **Scantlings:** Yard lumber two inches and under six inches thick, and under eight inches wide.

Structural Timbers

(3) **Heavy Joists:** Yard lumber four inches and under six inches thick, and eight inches or over wide.

(d) **Timbers:** Lumber six inches or larger in least dimension.

Manufacturing Classification

Manufactured lumber is classified as (a) rough, (b) surfaced, and (c) worked.

(a) **Rough** lumber: Undressed as it comes from the saw.

(b) **Surfaced** lumber: Lumber that is dressed by running through a planer. It may be surfaced on one side (S1S), two sides (S2S), one edge (S1E), two edges (S2E) or a combination of sides and edges (S1S1E), (S2S2E) or (S4S2E) or (S4S).

(c) **Worked** lumber: Lumber which has been run through a matching machine, sticker or moulder, Worked lumber may be (1) matched, (2) shiplapped, or (3) patterned.

(1) **Matched** lumber: Lumber that is edge dressed and shaped to make a close tongue and groove joint at the edges or ends when laid edge to edge or end to end.

(2) **Shiplapped.** lumber: Lumber that is edge dressed to make a close rabbetted or lap joint.

(3) **Patterned** lumber: Worked lumber that is shaped to a pattern or moulded form.

Standard Grade Names and Classifications

With regard to standard grade names the committee recommends that, to the extent to which differences in quality of timber, in conditions of manufacture, and in uses to which the product is put, will, in practical application, permit, the basic provisions for the grading of lumber should be uniform. The basic grade classification for yard lumber is shown in the accompanying table. The term "yard lumber" as here used means lumber that is manufactured and classified into those sizes, shapes, and qualities required for ordinary construction and general purpose use. (Heavy timbers for structural purposes, softwood factory lumber, hardwood factory lumber, and other special-use materials are not considered yard stock), On the basis of quality, yard lumber is divided into two main divisions (a) select lumber and (b) common lumber. These are again divided into two classes—select lumber (1) that suitable for natural finishes and (2) that suitable for paint finishes; common lumber into (1) that which can be used without waste (2) that which permits some waste. Each of these four classes is further divided into quality classes or grades.

Dimension lumber is graded as No. 1 common, No. 2 common and No. 3 common.

Standard Yard Lumber Sizes

The following recommendations apply to sizes:

That the terms standard board and standard dimension be adopted as designations for 1 inch boards (yard) and 2 inch dimension (yard) respectively and applied to both softwoods and hardwoods.

That 25/32 inch, S1S or S2S (measured at standard commercially dry shipping weight and moisture content for each species) be adopted as the minimum thickness for the standard yard board.

That 1-5/8 inches, S1S or S2S (measured at standard commercially dry shipping weight and moisture content for each species) be adopted as the minimum thickness for standard dimension not more than 12 inches wide.

That the finished widths of boards, dimensions and finished S1E or S2E (measured at standard commercially dry shipping weight and moisture content for each species) be 3/8 in. off, on lumber of standard widths less than 8 in.; and 1/2 in. off, on lumber of standard widths of 8 in. and over.

That the standard minimum thicknesses and standard widths of finished lumber be as follows:

Summary of Standard Sizes for Yard Lumber

S1S or S2S; S1E or S2E

1. Finish, common boards and dimensions.

Note: The thicknesses apply to all widths and the widths to all thicknesses

Product	Size, Board Measure		Dressed dimensions at standard commercially dry shipping weight and moisture content	
	Thickness	Width	Thickness (Minimum)	Width
	Inches	Inches	Inches	Inches
Finish		3	5/16	2 5/8
		4	7/16	3 5/8
		5	9/16	4 5/8
		6	11/16	5 5/8
	1	7	25/32	6 5/8
	1 1/4	8	1 1/16	7 1/2
	1 1/2	9	1 5/16	8 1/2
	1 3/4	10	1 7/16	9 1/2
	2	11	1 5/8	10 1/2
	2 1/2	12	2 1/8	11 1/2
	3		2 5/8	
Common Boards	1	3	25/32	2 5/8
	1 1/4	4	1 1/16	3 5/8
	1 1/2	5	1 5/16	4 5/8
	2	6	1 5/8	5 5/8
		7		6 5/8
		8		7 1/2
		9		8 1/2
		10		9 1/2
		11		10 1/2
		12		11 1/2
Dimension	2	2	1 5/8	1 5/8
	2 1/2	4	2 1/8	3 5/8
	3	6	2 5/8	5 5/8
	4	10	3 5/8	7 1/2
	Over 4	10	3/8 Off	9 1/2
		12		11 1/2

2. Siding, Flooring, Ceiling, Partition, Shiplap and Dressed and Matched

Note: The thicknesses apply to all widths and the widths to oll thicknesses

Product	Size, Board Measure		Dressed dimensions at standard commercially dry shipping weight and moisture content	
	Thickness	Width	Thickness (Minimum)	Face Width
	Inches	Inches	Inches	Inches
Bevel Siding		4	1/2 by 3/16	3 1/2
		5	5/8 by 3/16	4 1/2
		6		5 1/2
	Minimum		D & M	Shiplapped
Rustic and Drop siding	9/16	4	3 1/4	3 1/8
	3/4	5	4 1/4	4 1/8
		6	5 1/4	5 1/8
		8	7 1/4	7 1/8
		10	9 1/4	9 1/8
Flooring		2	5/16	1 1/2
		3	7/16	2 3/8
		4	9/16	3 1/4
	1	5	25/32	4 1/4
	1 1/4	6	1 1/16	5 1/4
	1 1/2		1 5/16	
Ceiling		3	5/16	2 3/8
		4	7/16	3 1/4
		5	9/16	4 1/4
		6	11/16	5 1/4
Partition			3/4	2 3/8
				3 1/4
				4 1/4
				5 1/4
Shiplap	1	4	25/32	3 1/8
		6		5 1/8
		8		7 1/8
		10		9 1/8
		12		11 1/8
Dressed and Matched	1	4	25/32	3 1/4
	1 1/4	6	1 1/16	5 1/4
	1 1/2	8	1 5/16	7 1/4
	2	10	1 5/8	9 1/4
		12		11 1/4

(1) The over-all widths of patterned material may be computed on the following basis: Based on material 1-inch thick, the tongue shall be ¼ inch wide in tongued and grooved lumber, and the lap 3/8 inch in shiplapped lumber; or, based on material 2 inches thick, the tongue shall be 3/8 inch in tongued and grooved lumber, and the lap 1/2 inch in shiplapped lumber, with face 1/8 inch narrower in 2-inch lumber than in 1-inch lumber.

3. Factory Flooring, Heavy Roofing, Decking and Sheet Piling

Note: The thicknesses apply to all widths and the widths to all thicknesses

Size, Board Measure		Dressed dimensions at standard commercially dry shipping weight and moisture content			
			Face Width		
Thickness	Width	Thickness (Minimum)	D & M	Shiplapped	Grooved for Splines
Inches	Inches	Inches	Inches	Inches	Inches
2	4	1 5/8	3 1/8	3	3 1/2
2 1/2	6	2 1/8	5 1/8	5	5 1/2
3	8	2 5/8	7 1/8	7	7 1/2
4	10	3 5/8	9 1/8	9	9 1/2
	12		11 1/8	11	11 1/2

That lengths in multiples of 1 foot be considered standard; that lengths not in multiples of 1 foot be considered special.

The following thicknesses and widths shall be considered standard. All other sizes shall be considered special.

Thicknesses:	5/16″, 7/16″, 9/16″, 11/16″, 1″, 1 1/4″, 1 1/2″, 1 3/4″, 2″, 2 1/2″, 3″, 3 1/2″, 4 inches and up in multiples of 1 inch for rustic, drop siding and partition. 3/4 inch, and for bevel siding, 1/2″ by 3/16″ and 5/8″ by 3/16″.
Widths:	1 inch and up, board measure, in multiples of 1 inch.

Summary of Basic Grade Classifications for Yard Lumber

Total products of a typical log arranged in series according to quality as determined by appearance.	**Select** Lumber of good appearance and finishing qualities.	Suitable for natural finishes.	Grade A—Practically free from defects.
			Grade B—Allows a few small defects or blemishes.
		Suitable for paint finishes.	Grade C—Allows a limited number of small defects or blemishes that can be covered with paint.
			Grade D—Allows any number of defects or blemishes which do not detract from a finish appearance, especially when painted.
	Common Lumber containing defects or blemishes which detract from a finish appearance but which is suitable for general utility and construction purposes.	Lumber suitable for use without waste.	No. 1 Common—Sound and tight knotted stock. Size of defects and blemishes limited. May be considered water-tight lumber.
			No. 2 Common—Allows large and coarse defects. May be considered grain-tight lumber.
		Lumber permitting waste.	No. 3 Common—Allows larger and coarser defects than No. 2 and occasional knot holes.
			No. 4 Common—Low quality lumber admitting the coarsest defects such as rot and holes.
			No. 5 Common—Must hold together under ordinary handling.

Methods of Lumber Measurement

Lumber of standard size shall be tallied board measure. On lumber of standard thickness less than 1 inch (board measure), the board foot measurement shall be based on the surface dimensions.

All dressed stock of standard size shall be measured and sold on the basis of the corresponding dimensions of rough green lumber; provided, that the measurement and description of thickness of such stock less than 1 inch thick, board measure, shall be its actual thickness in standard commercially dry condition. The finished dimensions of all dressed stock of standard size shall not be less than the standard minimum dimensions herein provided; and the finished dimensions shall be shown on the invoice.

The average length of a shipment of lumber 1 inch or less in thickness shall be computed by dividing the total length in feet by the total number of pieces in a shipment.

The measurement of thickness of lumber shall be as follows:

Measurement of Boards, Dimension, Finish, Flooring, Siding, Ceiling, Partition and Other Items of Dressed Lumber

	Board Measure Inches		Minimum Thickness S1S or S2S; at standard commercially dry shipping weight and moisture content Inches
Lumber measured as	1″	to be not less than	25/32″
" " "	1 1/4″	" " "	1 1/32″
" " "	1 1/2″	" " "	1 9/32″
" " ""	1 3/4″	" " "	1 7/16″
" " "	2″	" " "	1 5/8″
" " "	2 1/2″	" " "	2 1/8″
" " "	3″	" " "	2 5/8″
" " "	3 1/2″	" " "	3 1/8″
" " "	4″	" " "	3 5/8 ″

The measure and description of thickness of dressed stock less than 1 inch, board measure S1S or S2S, shall be its actual thickness at standard commercially dry shipping weight and moisture content.

(Note: It is to be understood that the thickness of rough lumber commercially dry, is in excess of the thickness of finished lumber of the corresponding size, board measure, by the amount necessary to permit of surfacing either one side or two sides).

Shipping Provisions

In shipments of rough boards and finish, pieces 1/2 inch or more above the count thickness, such as may be produced by uneven sawing, may, at the option of the buyer, be rejected or accepted as of the next lower grade.

Unedged lumber shall be measured across the average width of the board on the narrow face in 1 inch 1 1/4 inch, and 1 1/2 inch lumber. The width of 2-inch and thicker material shall be 1/2 of the sum of the average widths of the narrow and wide faces.

Small dimension stock shall be tallied by the board feet contents.

Material shipped on stock sizes shall be tallied by the number of pieces of each size and length in the shipment.

In shipments measured on board measure, a piece tally in board feet shall be made.

That the actual thickness and width of lumber shipped when not of standard size be indicated on invoice.

That in order to encourage the maintenance of standard sizes as agreed to, lumber manufactured and sold as standard, if grade-marked be marked by an appropriate brand or insignia to indicate that it is of standard size.

Larger Canadian Offices for Dake Engine Co.

The Canadian office of the Dake Engine Co., of Grand Haven, Mich., has been moved from 45 Adelaide St. E. to 502 Kent Bldg., Toronto. This change has been made on account of the increase in Canadian business since the company opened their Canadian branch office two years ago. The new quarters, being larger, will give increased facilities for handling customers' requirements.

Pawling and Harnischfeger Appointment

The Pawling & Harnischfeger Company of Milwaukee, Wisconsin, manufacturers of excavators, cranes and machine tools, have recently appointed Mr. R. P. McCormick as their Eastern sales manager with headquarters at 50 Church Street, New York City, and 605 Stephen Girard Bldg., Philadelphia.

Ottawa is Building Two Bath Houses

Following the Lead of Several Other Cities, the Capital is Installing Public Batheing Facilities—Description of the Champagne Bath in the East End of the City

A number of Canadian cities are now operating public baths, and this number is increasing as the public recognizes their usefulness. The city of Ottawa, Ont., will soon be classed among those to possess such a necessary improvement, as before long two modern public baths will be in operation there.

The following is a description of the east end bath. The other, which is located at the west end of the city, is of a somewhat different design from the one now to be described.

Exterior view of Ottawa's new bath house

The east end or the Champagne bath is a structure built of stone, concrete, brick and metal throughout, including floors, doors and sashes. It is divided into two departments, one containing the administration offices, the dressing rooms, shower baths, toilet rooms, etc., and the other exclusively used for the swimming pool, the former measuring 50 ft. x 45 ft., and the latter 92 ft. x 45 ft. The total height from the deepest point in the pool to the highest point of the roof is 38 ft.

The foundation walls of the building measure 18 inches in thickness, and rest on concrete footings. The outer walls are constructed of local brick and interlocking tile plastered on the inside. The front wall is considerably ornamented with carved Indiana limestone which presents a pleasing appearance. The steel roof is covered with galvanized iron tile.

The Swimming Pool

The dimensions of the swimming pool are 75 ft. x 30 ft.; its walls are made of waterproof reinforced concrete and lined with ceramic mosaic tile. The floor of the pool is on an incline as is clearly shown in one of the accompanying illustrations. Steel ladders and diving platforms are provided opposite and above the deepest point in the pool which is about 9 feet. A six-foot tile platform is built around the pool, the floor of which is a few inches above the water line of the bath. There is also an elevated gallery located ten feet above the floor and extending entirely around the pool. It is provided with an iron hand railing and is supported on steel columns.

There is a gutter formed in the walls of the pool, the bottom of which is semi-circular in section. Drains or overflows are provided at different intervals along the walls of the pool, and there is also a number of vacuum outlets arranged along the walls of the bath section for removing any sediment which may sink to the bottom.

The water for the swimming pool is heated by special heaters and kept automatically at a fixed temperature. The design is so arranged that the water which flows into the pool at a constant rate is continuously withdrawn, filtered and returned to the bath. The arrangement of the regulation of the flow is such that the water can be entirely renewed in from 24 to 48 hours, the time depending on the number of bathers; but the pool can be completely emptied in five hours if it should be so desired.

The entire exposed surfaces of the pool section are enameled white, presenting a neat and inviting appearance. There is a complete elimination of corners and cornices, which keeps to a minimum any accumulation of dirt and dust. The pool is top lighted by means of numerous skylights, an ideal light for swimming purposes.

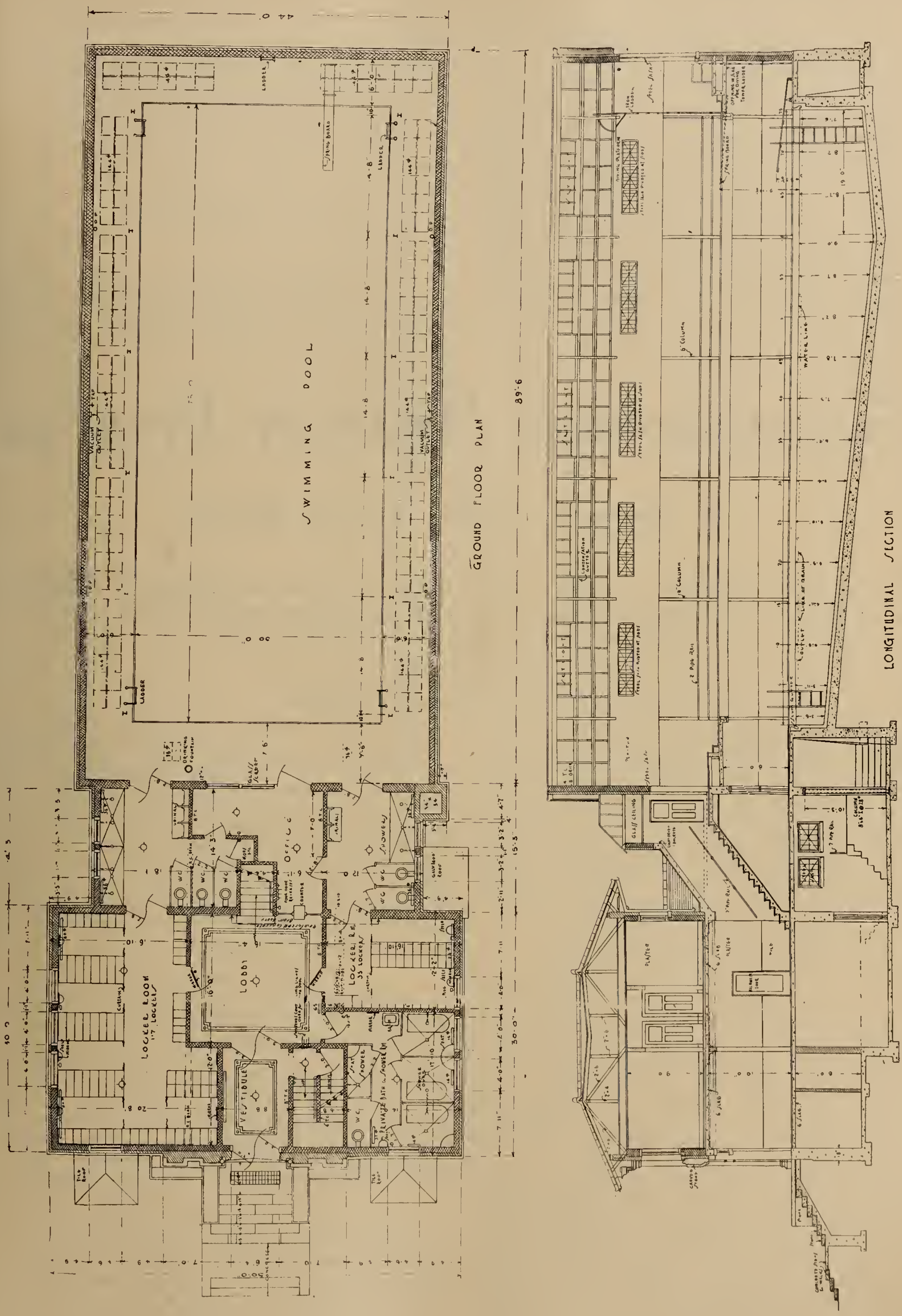
The arrangement of the passages from the dressing rooms to the swimming pool is such that the bathers must pass from the locker rooms through a shower bath before entering the pool, and the public wishing to go up in the gallery are sent direct there from the public hall, as access to the floor surrounding the pool may only be had by the bathers.

Administration Section

The administration section of the building is also modern in every respect. It contains on the ground floor, a 16 feet square lobby, an office, public shower and locker rooms, toilet and a private bath and shower room. On the upper floor is the janitor's residence comprising a hall, living and dining rooms, kitchen, two bedrooms and a bath room. The basement, access to which may be had by an outside entrance, contains public lavatories for men and women. It also contains storage rooms, coal bins, the boiler room and the mechanical equipment for the swimming pool.

A view of the swimming pool

The steps and doorways to the entrances, which



Ground floor plan and section of the Champagne public bath house, Ottawa, Ontario are closed by steel doors, are made of cut stone and concrete. The main entrance leads to the lobby through an 8 ft. x 12 ft. vestibule, and around the former are distributed the other departments of that section of the building.

On the main floor there are two locker rooms, one containing 117 lockers and the other, 35; these are arranged in rows back to back, and spaced 3½ ft. apart. There is a mirror and a glass shelf at the inner end of each aisle which is closed off, by duck curtains. There are two shower bath rooms, one containing five shower equipments, and the other three. The floors of the shower bath rooms are made slightly sloping toward drain openings covered with strainers. There are five toilet rooms on this floor in connection with the shower baths. There is at the front end of the building a private bath and shower room, which contains three tub baths, a shower, toilet and dressing space.

The office is located so that the supervisor can see over both the main entrance and the swimming pool. The door to the private bath room and the doors of the locker rooms are electrically controlled from the office.

All floors of the administration end of the building are finished with terrazzo, and all interior walls and partitions are finished with marble.

There are two reinforced concrete stairways leading from the ground floor, one to the janitor's residence, and one to the balcony above the swimming pool.

The building is heated by steam.

The cost of the structure will be about $80,000, it is expected.

Messrs. Noffke, Morin & Sylvester, of Ottawa, Ont., are the architects who designed and supervised the construction of the Champagne bath just described. Mr. W. Monette, of Ottawa, is the general contractor.

Saskatchewan's Highway Progress

A Review of the Year's Work

Over One Million Dollars Will Have Been Spent on Provincial Highways During 1923, as Well as $380,000 on Market Roads—Maintenance Department is a New Feature of Saskatchewan's Organization

By H. S. CARPENTER

Deputy Minister of Highways of Saskatchewan

The department of highways for the province of Saskatchewan administers the money voted by the legislative assembly for the construction and maintenance of roads on the provincial highway system and the main market roads; bridges; dams and reservoirs (for the securing of a water supply for cattle and threshing purposes in these districts where the natural supply is limited or difficult to obtain); the operation and the maintenance of public ferries and the making of road surveys in connection with any of the above works, also drainage works.

The Roads of the Province

The roads of the province are practically all earth roads with earth surfaces. Very little gravel surfacing has yet been done, owing to the scarcity of gravel deposits and the necessity of first building up the earth roads to form a satisfactory and consolidated base for the deposition of a gravel surface, and the establishment of a proper system of connected drainage to these roads. There are no macadam, asphalt or concrete roads outside of the boundaries of the cities.

In the settled area of the province there are some 210,000 miles of surveyed road allowances in a more or less improved condition. The main market road system absorbs 32,000 miles of this amount. The main market roads are those roads on which traffic is concentrated and which communicate in a definite direction from the farming settlements to the market centres having railway depots. Again, of this 32,000 miles, about 7,300 miles of road has been selected and classified to form the Saskatchewan provincial highway system. The roads so selected are inter-urban and inter-communicating roads, from one market centre to another and it is on this system that the work of road construction under the "Canada Highways Act" is undertaken, with the federal government contributing 40% of the cost and the Saskatchewan government contributing 60% from provincial funds. The rural municipalities have not been called upon to contribute any money from their local funds towards the building of the sections of highways selected for construction with federal aid.

Provincial Highways

During 1923 the construction was continued of those sections of the provincial highway system for which agreements have been entered into with the federal government and it is anticipated that by the end of the season a total of 1,075 miles of the system will have been completed. The work this season consists of completing the unfinished mileage profiled and laid out during 1922, and the construction of at least 315 miles profiled for the season of 1923. It is expected that the expenditure of these highways for the full fiscal year will be $1,060,000. Nearly the whole of the work is undertaken under contracts let by public tender to the lowest bidder, but on a half dozen sections, owing to conditions not being favorable to the letting of the work by contract, the work has been placed in the hands of road foremen with gangs organized by the department on a day labor basis. Of the above cost the Federal government will contribute 40% and the Saskatchewan government, 60% from the provincial funds. The rural municipalities will not contribute from their own funds towards the cost of the construction of these highways. The total expenditure on provincial highways to April 30th, 1923 on 760 miles of roads was $2,008,000.00 and the subsidy received from the federal government on this expenditure was $747,519.00.

Main Market Roads

For the construction and improvement of this class of roads the department uses:—(a) the road organizations of the municipalities, and (b) its own labor force employed during the season directly under foremen appointed by the department on a day labor basis.

In handling road construction work and using the municipal organizations, specific contracts for a given amount covering the work to be done, are entered into between the minister of highways and the rural municipalities in accordance with specifications framed by the department and approved by the minister. On completion of the work, the municipality reports and presents a request for payment. The work done is then inspected by an official of the department and is paid for on a certification from the inspector that full value has been received for the money provided. The work undertaken by the road foreman is also subject to close inspection.

The work authorized from year to year on the main market road system is not continuous in mileage, the policy of the department being that the most urgent and important sections of the main market road system that require attention are selected each year, so that the improvement of this system is a matter of annual progression. This work takes the form of assistance to the rural municipalities in their road construction and the end in view is to systematically eliminate or lessen the obstacles to travel on individual sections of the main market system from year to year and to build up on this system a reliable and uniform standard of earth not quite equal to and not as expensive as the provincial highway system.

It is anticipated that expenditure on this class of roads for this season will not be less than $380,000.00. It may be said that the whole of the 25,000 miles forming the main market road system is in a more or less improved condition and can be travelled at all seasons of the year without difficulty, except at some weak links during periods of excessively rainy weather.

Construction of Bridges

For concrete and steel bridges built for capital account the government will spend not less than $120,000.00 and upon timber bridges, new structures and those replacing decayed ones, more than $150,000.00. Concrete and steel bridges are being constructed under contracts let by public tender; the contracts go to the lowest tenderer. The timber bridge work is handled by regular gangs organized by the department; they work on a day labor basis during the season.

Maintenance of Provincial Highway.

This spring a distinct branch of the department was organized to establish a systematic and permanent system of maintenance of provincial highways in accordance with the agreement entered into between the provincial and the federal governments. The road drag competition formerly held annually by the government had been discontinued in 1922 and the legislative assembly in their session of 1922-23 had amended section 8 of the Highways Act, relating to grants to rural municipalities for maintenance of roads, so that no provision is now made for the payment of a maintenance grant in cash to the rural municipalities. The department has therefore used the money devoted formerly to the above purposes as a fund from which to operate their maintenance organization on those sections of the provincial highways which have been completed and taken off the hands of the contractors. The rural municipalities have not been required to contribute any money from their local funds towards the maintenance of these completed sections of the provincial highways.

Early in the spring, this branch of the department outlined an adequate patrol system, dividing the completed roads into sections, appointing patrolmen on these sections and supervisors over divisions embracing several of these sections and supplying the patrolmen with the necessary road drags and tools to completely patrol and maintain 900 miles of completed highway. In addition to this mileage, this branch have extended their work to cover 220 miles of road abutting on the completed highways in order to keep in repair certain connecting roads that form links of the highway system. These sections, of course, are not up to the uniform high standard of the provincial highways but are sufficiently improved to warrant immediate maintenance by the branch.

On account of inadequate drainage and low grades, the exceptionally wet season made the problem of keeping up this class of road difficult and any acute interruption to traffic on roads maintained by the department occurred on these sections. The season proved to be an unusually wet one, with spasmodic heavy rainfalls and the water lay in the ditches for long periods, but it is pleasurable to note that under such trying conditions no serious interruption of the general traffic has been reported on these sections of the highway under direct control of the maintenance branch of the Department. It is expected that the department will expend not less than $80,000.00 on this maintenance work for the full season.

In addition to the above expenditures will be made on the following activities:—

Public ferries at 45 crossings, carrying over 600,000 units of traffic for the season	$115,000.00
Fireguards	500.00
Water supply	5,000.00
Surveys for road construction, etc.	56,000.00
Drainage works	75,000.00

Irrigation

There is a large irrigation scheme north of Vidora pending that will probably involve an expenditure of $300,000.00 The department's share in this work is surveying and organizing the irrigation area, securing the necessary authority from the government to invest the officials of the scheme with the necessary powers to raise the money from the residents of the area affected by the scheme for the cost and maintenance of the work. Beyond assisting in the organizing of the scheme, the engineering and surveys, the government does not contribute towards the construction of the irrigation works. The particular scheme above mentioned is at the east end of Cypress Lake, north of Vidora.

Will the Railroads Benefit from Truck Traffic?

The Relationship of Rail and Highway Transport

Co-ordination of Motor Truck and Rail Service Will Produce Economical and Profitable Results for the Railroads

By ARTHUR H. BLANCHARD
Professor of Highway Engineering and Highway Transport, University of Michigan

What is the present attitude of railroad officials towards the development of highway transport? The answer is not a simple one to formulate as many diverse opinions have been expressed in words and actions. Some of our railroad officials appreciate the intrinsic value of highway transport and have made use of it as a part of their own transportation systems. Others have advocated its development because they know that it is necessary to the success of their business that facilities should be provided for economically transporting goods over highways to be later carried by railways. Others have been concerned regarding the development of highway transport from the standpoint of destructive competition with railroad transportation and have endeavored to curtail its development through legislative action. Others, and it is hoped that there are only a few in this class, have considered the subject from such a narrow viewpoint that they have advocated a curtailment of highway improvement.

It may appear audacious to bluntly announce that highway transport is an aid to the railroads especially in view of statements frequently appearing such as that of one railroad president who charged a deficit of $4,856,000 to motor vehicle competition. Bald conclusions of this character appearing in the public press bring to the mind of the reader the much maligned motor truck tearing up the public highways. The public does not analyze the true meaning of the loss in revenue. It does not appreciate the large percentage of reduction of railroad receipts due to the operation of the family motor car. It does not know that some railroads are experiencing a reduction in gross revenue but would not suffer a loss in net profits provided that they efficiently used their facilities for the handling of those phases of transportation for which they are pre-eminently adapted to handle profitably.

The average citizen has lost sight of the usual consequences which follow the development of a new mechanical invention of benefit to mankind and the use of which contributes to national progress. Many railroad officials appear to have forgotten what happened to canal and river traffic and profitable commercial highway transport in the days when stages constituted the only common carrier for overland transportation. The disastrous effect on the balance sheets of canal, river and stage companies of the laying of hundreds of miles of rails wherever there was an evident field for bulk or mass transportation is a chapter in the story of railroading known to all.

Railroads are not going to cease to function because of the development of highway transport. The railways are and always will be a vital part of our transportation system. They, however, have an economic field which has clearly been defined by Professor Henry E. Riggs of the University of Michigan when he said at a convention of the National Highways Traffic Association that "Railway transportation for long distance business, and for all carload business where there is direct track connection to the factory or warehouse of the shipper is and always will be more economical than any form of highway traffic." The writer is an optimist and therefore believes that the railroad official will see the light shining from the beacons of publicity and dissemination of knowledge and will soon administer his system of transportation with full recognition of the true value of highway transport to the railroads and the part which it will play in national development.

Highway Transportation Feeders

The railroads can render immediate valuable service to the public and to themselves by helping to direct the development of highway transport as feeders to rail lines and as extensions of rail service. A correct and immediate solution of the inter-relationship between these two links of our national distribution system is very desirable in the interests of public welfare.

What are the opportunities for the railroad to function as an operator or user of highway transport?

First: The transportation of freight by motor trucks from one railway terminal to another in the same or nearby city. The advantages of the utilization of highway transport, as compared with the tedious method of rail transportation by "trap" or "transfer" cars over congested tracks have been appreciated by a few railroad officials.

Second: The organized delivery with motor trucks of carload freight from public team tracks in large terminal areas. With such a system in effect, it has been stated that the present freight car equipment of the railroads would be sufficient to meet all transportation needs for several years to come.

Third: Extension of transportation service through the medium of motor truck and motor bus routes. There are several methods of development practicable in this field. Urban and interurban electric railway lines may logically expand their passenger transportation facilities through the establishment of tributary motor bus routes. During 1922, sixty electric lines throughout the United States used motor buses to supplement their rail service. Steam railroads may enter this field through the development of intercity and rural motor express lines to carry both commodities and passengers. One of the most notable examples is afforded by the highway transport services of the Great North of Scotland Railway Company which established its first motor truck service in 1904. In 1921, this railway company was operating five passenger routes and seven intercity truck routes. Railroads having stations in scenic areas may well give consideration to another development by the Great North of Scotland Railway Company which operates from Aberdeen a motor bus line for tourist traffic.

Collection and Delivery of Freight

Fourth: The collection and delivery of freight in municipalities and adjoining areas, which is similar to the methods universally employed in large cities for handling express shipments. This phase of highway transport would be a development of what is commonly known as the store door delivery plan. A development in Michigan is the plan of the Detroit United Railway to establish a pick up and delivery system with motor trucks especially equipped to carry box containers, one or more containers being used for the freight of one shipper. In England, we find railroads functioning as operators of highway transport in this field. One of the most notable examples is the case of the London and Northwestern Railroad's comprehensive system of freight delivery by motor trucks in areas with headquarters at London, Birmingham, Manchester, Liverpool and Leeds.

Replace Unprofitable Branch Lines

W. H. Lyford, vice-president of the Chicago and Eastern Illinois Railway Company, believes that another field for the profitable use of the motor truck is the transportation of freight between communities which are served by branch lines of railway on which the traffic is too light to pay the expenses of any kind of railway transportation. He further says that no more such branch lines ought to be constructed if the highway transport operator will take over this field and occupy it intelligently and efficiently, and that money losing branch lines along which transportation by motor truck over existing highways could be furnished at less expense should be abandoned.

To cut down operating costs on branch lines, forty steam railroads are now using flanged wheel motor buses. Another development may be the reconstruction of the railroad roadbed as a private highway for the use of the railway company's trucks and trailers or its operation as a toll-road, which, if properly constructed without grade crossings for four lanes of traffic, could accommodate slow moving trucks and trailers and high speed motor buses.

Elisha Lee, vice-president of the Pennsylvania Railroad, goes a step further when he states, "The railroads still do a great deal of purely retail business. Some of it perhaps pays its way, but much of it unquestionably entails a loss. In the immediate vicinity of all our highly developed commercial and industrial communities, an immense amount of such traffic originates. A large portion of it moves only a few miles but in its handling we are obliged to employ the most costly and overworked facilities which the railways own, namely, the yards and terminals in the great centers of industry and population. Here is a real opportunity for the motor truck to demonstrate its utility upon a true economic basis. The reason why less than carload traffic, especially on the shorter hauls, is becoming a growing burden upon the railroads is that we are obliged to use it in terminal facilities and rolling stock which are too expensive for the purpose and which of necessity must be primarily planned and adapted to the handling of bulk traffic, mostly moving over the longer hauls. Therefore I believe it to be at least probable that in many instances the short haul less-than-carload freight traffic could be turned over bodily to motor trucks with resulting advantage to the railroads and the patrons."

The views of many officials on certain phases of the interrelationship between railway and highway transport are indicated by the following excerpts from the 1922 report of the Committee on "Motor Transportation" to the National Association of Railway and Utilities Commissions:

For Small Shipments

"Auto truck transportation meets a public demand in the rapid transit of less-than-carload shipments, including the door-to-door delivery element which railroads have thus far failed to furnish. Railroad companies have exhibited a degree of indifference or slowness bordering on stupidity in recognizing and meeting demands of the public for quicker and more convenient movement of less-than-carload freight.

"It is evident if rail carriers hope to retain their short haul freight traffic, it will be necessary for them to make radical changes, both in service and equipment. Trucks are rendering an astonishing service between shopping centers and outlying trading points. Country merchants prefer direct truck service to the railroads even where the cost of the service is equal, for the reason that the trucks call at the wholesale house, receive the commodities desired and unload them at the store doors. This enables the country merchants to conduct business with a smaller stock of goods, for the reason that new supplies can be obtained conveniently and on short notice through truck service.

"Another respect in which truck service is preferable, is in the movement of household goods from one town or city to another. The principal expense in shipping by rail consists in crating the household goods and preparing them for shipment. In addition to the cost of crating, is that of cartage from the house to the depot and from the depot to the house. Furthermore, these additional handlings increase the loss and damage by breakage. It is difficult of course for rail carriers to meet this sort of competition, and thus far they apparently made no effort to do so."

Saving in Crating Costs

The cost of crating for railway shipment is well illustrated in the case of the transfer of the Davis Library of Highway Engineering and Highway Transport from Columbia University in New York City to the University of Michigan in Ann Arbor. The contract price for the crating of the Library, the contents of which filled one freight car, was $1,000, while if the library had been transferred by motor truck, it would only have been necessary to box books and periodicals, the cost of which was $120. Another illustration is the case of the Remington Typewriter Company which transports from its factory in Connecticut all of its typewriters consigned to New York City by motor trucks equipped with special compartment bodies. The saving in cost of packing is $1.00 for each machine or $300 for each truck shipment.

[Address delivered at the joint session of the North Central Division of the National Highway Traffic Association and the Michigan State Good Roads Association on November 6, 1923.]

U. S. Portland Cement Production Sets New Record in October

Production of portland cement in the United States during October was the largest for any month this year and incidentally broke all records for a single month. Report of the United States Geological Survey places the total production for the month at 13,350,000 barrels compared with 13,100,000 in September and less than 12,300,000 a year ago. For the ten months ending October 31, over 114,000,000 barrels were produced exceeding last year's record output for the same period by 20,000,000 barrels or 22%.

Shipments from the mills in October were 14,285,000 barrels, an increase of about 11% over October 1922. Shipments for the ten months were close to 119,000,000 barrels or more than was shipped during the entire banner year 1922.

Stocks of cement in manufacturers' hands at the end of October were about 4,600,000 barrels or 450,000 barrels more than a year ago. Consideration of the fact that stocks of cement at the beginning of the year were very much lower than at the beginning of 1922, and the ten months' shipments have been 17,000,000 barrels greater than last year, serves to indicate how successfully the industry has coped with the increased demand. The greatly increased efficiency of the transportation systems has helped materially in making this record possible and recent increases in productive capacity have given the industry a substantially greater output.

Long Column Timber Tests

Tests on 12 by 12-in. by 24-ft. southern yellow pine and Douglas fir timbers are under way at the Forest Products Laboratory, Madison, Wis., in co-operation with the National Lumber Manufacturers' Association. The purpose of these tests is to study column formulas and laws, to obtain data on the effect of density and defects, such as knots and shakes in columns, and with these data as a basis to recommend safe working stresses for structural columns. The testing program as outlined covers a four-year period and will include tests on both green and air-dried material, ranging in quality from clear and dense to very defective and light-weight material. The timbers required for the program are divided into four shipments for delivery to the laboratory at approximately six months intervals. Tests have been completed on two shipments of green southern yellow pine and one of Douglas fir. About two years more will be required before all the tests are completed.

Japanese Government Buying Lumber in Large Quantities

The Japanese government has awarded contracts for 97,150,000 feet of lumber for use in building dwellings for Japan's homeless in the area devastated by the earthquake. All of the lumber covered by these contracts will be distributed, after its delivery at Japanese ports, among many thousands of Japan's destitute and suffering, and individuals most in need will assume responsibility for rebuilding their homes.

It has been emphasized that this and other construction of dwellings in the wrecked areas is of a temporary character. No definite plan has yet been evolved by the Japanese board of reconstruction concerning plans for permanent rebuilding. This phase of Japan's reconstruction program is moving slowly, as much research work and study will be required before the board's recommendations are transmitted to the Japanese Diet for approval.

Decline in Building Permits During October

There was a slight decline in the value of the building permits issued during October as compared with the preceding month, and the value of anticipated building was also less than in October of last year. Reports were tabulated by the Dominion Bureau of Statistics from 56 municipalities which had issued permits to the value of $9,701,080 in October, 1923, as compared with a total of $10,485,613 in September, 1923, and of $10,344,770 in October, 1922. There was, therefore, a decline of $784,533 or 7.5 per cent in the former comparison and of $643,690 or 6.2 per cent in the latter.

Forty-seven cities furnished detailed statements showing that they had issued approximately 1,400 permits for dwellings, estimated to cost nearly $6,200,000, and for over 3,000 other buildings at a proposed cost of approximately $3,400,000. It has been pointed out in previous reports that, since the construction of several buildings is frequently authorized by one permit, the number of buildings to be erected is somewhat larger than the number of permits issued.

New Brunswick, Ontario and Saskatchewan registered increases in the value of the building authorized as compared with September. The gain of $347,291 or 7.4 per cent in Ontario was actually the greatest, but the largest proportional increase (of $46,445 or 95.6 per cent) occurred in New Brunswick. Of the decreases in the remaining provinces, those of $448,288 or 38.3 per cent in British Columbia and of $391,467 or 11.6 per cent in Quebec were the largest actual declines, while the most pronounced percentage loss (61.9) was recorded in Alberta.

Quebec, Manitoba and British Columbia registered increases in the value of the permits issued as compared with October, 1922. The increase of $703,423 or 30.7 per cent in Quebec was the largest actual gain, while Manitoba, where the value of the contemplated building increased by 46.3 per cent, showed the most pronounced proportional gain. Ontario, with a decline of $1,250,760 or 19.9 per cent, recorded the heaviest loss, while that of $185,525 or 67.2 per cent in Nova Scotia was also extensive.

Montreal, Winnipeg and Vancouver registered smaller totals of prospective building than in September, but the value in those three cities was higher than in October, 1922. In Toronto, on the other hand, the value of permits issued was greater than in the month before but less than in the corresponding month of last year. Of the smaller centres, Fredericton, Westmount, Guelph, London, Ottawa, Owen Sound, Peterborough, St. Catharines, Windsor, St. Boniface, Moose Jaw, New Westminster, Point Grey and Victoria recorded larger totals of estimated building than in either September, 1923, or October, 1922.

The value of building permits issued during the first ten months of this year was slightly over 8 per cent lower than during the corresponding period of last year, but there was an increase of 18,5 per cent over the first ten months of 1921.

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The Contractor's Duty to Use Standardized Equipment

Standardization of construction equipment is a subject that should make a strong appeal to every contractor, for it vitally affects the economy of his operations and consequently concerns his pocket-book. In the United States definite progress towards standardization has been made, particularly in regard to mixers and wheelbarrows. Manufacturers of these types of equipment, under the guidance of the Associated General Contractors, have entered heartily into the movement with the result that by the elimination of unnecessary types, the number of styles of both mixers and barrows has been considerably reduced. Certain standards have been formulated, to which the manufacturers have undertaken to adhere.

The Associated General Contractors are accepting the responsibility of passing on the standards but until their standardization organization is prepared to appoint a committee to test the individual types of mixer equipment made by the various manufacturers with respect to adherence to the adopted requirements, affidavits by manufacturers will be accepted as indicating that equipment is complying with the terms of the coded standards. Upon receipt of each of these affidavits at headquarters, the privilege of using the standard name-plate will be granted. The plates will be furnished by the Joint Committee on Construction Equipment. The plates will be sold at nominal prices, probably ranging from thirty-five cents to $3.50, the sum being dependent upon the selling price of the equipment on which the plates are to appear. Any profit resulting from this sale of plates will be used by the Joint Committee to further the work of standardization of equipment. A form to be used by mixer manufacturers in making affidavits declaring equipment to meet the prescribed standards will be issued soon.

As regards the standardization of wheelbarrows, the various manufacturing companies have made individual publications of the standards advising their jobbers of the details involved, have made requests for additional information covering specific cases from the association, have commended the work, and apparently are exercising effective means to bring about complete adoption.

It is thus evident that very considerable progress has been made, and each succeeding day lays additional emphasis upon the fact that general contractors now are entering into a position where they themselves will be responsible for the degree of fulfillment that will crown equipment standardization efforts.

Now that the actual application of the agreed standards to practice already is in its initial stage, with jobbers rapidly becoming acquainted with details being supplied by manufacturers, the duty of assuring success to this economy move is passing to the contractors. It soon will be directly and generally "up to" the purchasers of equipment to ask for the standardized types.

Bonding Practice Comes in for Criticism

More injury to public owners and to the industry as a whole is attributed, according to a news-letter of the Associated General Contractors of America, to the promiscuous writing of surety bonds than to any other single cause, and at the last annual meeting of the organization a conviction was forcefully expressed that the time was fast approaching when bonding companies must answer to the public for the injurious effects of the present system. The opinion has been freely expressed not only by contractors and engineers, but also occasionally by an official of a bonding company, that just so long as any individual possessing neither experience, organization or demonstrated ability can secure a bond, the construction industry will be looked upon as the black sheep of the industrial family.

Whether the bonding companies will clean their own house before it is given a clean-up by regulatory legislation, is a matter that they alone must decide, but there appears to be little doubt in the minds of the Associated General Contractors that an industry as essential and as potentially powerful as the construction industry will tolerate but little longer the sinister influence exerted by the promiscuous bonding of irresponsible bidders.

In view of this opinion that association is giving the matter serious study and desires to obtain full information before outlining a recommended course of action. With this in view a number of points, listed below, are suggested as a basis of discussion, so that data, either proving or disproving the soundness of any point, may be produced.

1. Why in the face of repeated damage to public owners are incompetent and irresponsible bidders awarded contracts.

The following may be worth considering:

a. Under-valuing by public officials of the efficiency and economy in construction resulting in skillful construction management.

b. Inadequate means whereby officials can ascertain the qualifications of a bidder and make an intelligent selection with respect to a given project.

c. Acceptance of proposals from bidders known to be incapable of executing the work—possibly due to existing laws, political pressure or other circumstances which make rejection of such proposals an unpleasant procedure.

d. Failure to comprehend that a default is an expensive and injurious occurrence under any circumstances.

e. The case with which incompetent firms or individuals, professing to be contractors, may secure surety bonds.

2. How much has the premium on surety bonds been raised in the last ten years? Why? Possibly on account of:

a. An increase in the expense of procuring and administering the business.

b. A slight increase in profit.

c. An increase in the losses paid on account of defaults.

3. Why are the losses paid on account of default so great?

Some one has suggested:

a. That the surety companies bond too many firms that are incapable of executing their contracts.

b. That the increased losses may readily be covered by an increased premium.

4. How can the losses from defaults be reduced?

a. By careful investigation of the bidder's qualifications.

b. By refusing to bond any bidder incapable of performing a contract.

5. How may bond premiums be reduced?

a. Voluntarily, by the bonding companies through elimination of promiscuous bonding, thus reducing their losses.

b. Through the establishment of competition outside the bonding business by the optional use of negotiable securities in place of the surety bond.

What "Board Measure" Means

The foot "board measure," from the beginning of its use nearly one hundred years ago has meant log or timber measure, applying to lumber in the condition in which it lies in the log or in the tree, namely, as it falls from the saw, green. To predicate an argument on the application of "board measure" to so-called "commercially dry" lumber, rough, is in principle equivalent to reciting a contention that there are 17 ounces in a pound.

From the beginning of the development of the present customary rules for applying board measure in timber cruising and log scaling, the board foot has meant a section of the contents of the tree or the log 1" thick, 1' wide and 1' long, which under certain conditions could be cut from the log.

It may be that the contention is correct that the commercial measurement of lumber should be in commercially dry (or for that matter even in a surfaced) condition. The point, however, is that such a measure would not be "board measure" for the same reason that 17 ounces does not constitute a pound avoirdupois and 105 c.m. does not constitute a meter. If the lumber industry wants to use board measure, it should apply board measure and not create a new definition of it. The only effect of that would be a double meaning for the term "board measure."—J. W. Blodgett.

The Week's Developments in a Nutshell

It is estimated that twenty-five thousand Canadians left Canada for the United States during the past month. This is merely an estimate, as the government apparently does not keep a record of people leaving the country for permanent residence elsewhere. The Dominion Government's present efforts to bring more immigrants into Canada may, we think, well be extended to finding out how many of our good citizens are going out—and why they are going. There is little doubt that in a number of cases they are following a will-o-the-wisp, anticipating better conditions that don't exist. This means perhaps that some of them will be back in the spring, wiser and poorer. But it would seem that our government ought to get in touch with these emigrants. If they are undesirable let them go and don't let them back, but if they are desirable make every effort to hold and satisfy them.

General business conditions have improved during the last week. For example, the shoe retail trade has made a decided gain. There has been little change in the demand for building supplies. The iron and steel industry is in better shape than was anticipated. The West is regaining its old-time optimism as the effect of the bumper harvest is being felt.

Prices of building materials remain steady. Indeed this is remarkably true of all commodities. Fisher's index of wholesale prices of two hundred representative commodities which on July 1 was 154 stood at 152 on Nov. 15. During the week slight recessions were recorded for boiled and raw oil and turpentine. Fir timbers advanced 5 to 10 dollars.

Our trade figures for October, just made public, show exports again in the ascendant, by nearly twenty-four million dollars, over imports.

Hints for the Contractor

Handy Reference Tables for Making Concrete

Some very useful information for contractors, arranged in condensed form, has been published in a folder issued by the Edison Portland Cement Co., New York City. The data relates to the mix of concrete and size of stone required for various classes of work, and also to the amount of materials necessary for concrete or mortar of various thicknesses. This information is contained in Tables 1 and 2, respectively. The following explanation indicates how to use the tables, the example taken being a concrete coal bin, 6 ft. long 5 ft. wide, 5 ft. high, with walls 4 in. thick and floor 2 in. thick. In table No. 1 we find for coal bins a 1:2½:4 mixture using 1½ in. maximum size stone is recommended for best results. The coal bin has 110 sq. ft. of 4 in. thickness and 30 sq. ft. of 2 in. thickness. Hence, referring to table No. 2 under 1:2½:4 proportion, we find for 1,000 sq. ft., 4 in. thick, that we require 69 bags of cement, 171 cu. ft. of sand, and 275 cu. ft. of gravel. So, for walls of our job, of 110 sq. ft., we requrie about 1/10 of these materials, or 7 bags of cement, 17 cu. ft. of sand, and 28 cu. ft. of gravel. For the floor we require 30 sq. ft. of 2 in. thick. Again in the table we find, under the proper headings, the materials required, this time using 30/1000 or 3/100 of the amount required for 1,000 sq. ft. This can easily be found by multiplying the 1,000 sq. ft. amounts by .03. Adding this to the amount required for the walls we get total amount of materials required.

Table No. 1
Mixtures and Maximum Size Stone

	Max. Size Stone
1:1:1½ mixture for:	
Wearing course of two-course pavements	¾"
1:2:3 mixture for:	
One course walks, porch and basement floors, pavements and steps	1½"
Basement walls exposed to moisture	1½"
Fence posts, gate posts, benches	¾"
Sills and lintels without mortar surface	¾"
Wells and cisterns, watering troughs, tanks	1 "
1:2:4 mixture for:	
Foundations for form machinery	2 "
Concrete work in general	1½"
1:2½:4 mixture for:	
Coal bins, grain bins, silo walls, and such	1½"
Building walls above ground	1½"
Walls of pit or basements	1½"
Base of two-course floor or pavement	2 "
Mortar	
1:2 mixture for:	
Wearing course of two-course and pavements	¼"
Flower Boxes	¼"

A 1:2:3 mixture means 1 sack (1 cu. ft.) of cement, 2 cu. ft. of sand, and 3 cu. ft. of pebbles or stone. The first figure is for cement, second for sand, etc.

The folder contains the following general information of importance.

No dirt or finely powdered sand should be used.

Keep cement in dry place until used.

Sand should be clean. Gravel should be clean. Water should be clean. Tools should be clean.

All materials should be accurately measured.

Concrete should be wet enough to form a jelly-like mass but never so wet as to flow easily or soupy.

Materials Required for 1000 Sq. Ft. of Surface for Various Thicknesses of Concrete or Mortar:

C- Cement in Sacks.
FA- Fine agg. (Sand) in cu. ft.
CA- Coarse agg. (Stone) in Cu. ft.

Quantities may vary 10 per cent either way according to aggregate used.
No allowance made for waste.

Thickness in Inches	PROPORTION																							
	1:1½		1:2		1:2½		1:3		1:1:1½			1:2:3			1:2:4			1:2½:4			1:2½:5		
	C.	F.A.	C.	F.A.	C.	F.A.	C.	F.A.	C.	F.A.	C.A.	C.	F.A.	C.A.	C.	F.A.	C.A.	C.	F.A.	C.A.	C.	F.A.	C.A.
⅜	18	27	15	30	13	32	11	34															
½	24	36	20	40	17	43	15	44	18	18	27												
¾	36	54	30	60	25	63	22	68	27	27	41												
1	48	72	40	79	34	84	30	89	37	37	55												
1¼	60	90	49	99	42	105	37	111	46	46	68												
1½	72	108	59	119	51	127	44	133	55	55	82												
1¾	84	126	69	139	59	147	52	157	64	64	97												
2	96	144	79	158	68	169	59	177	73	73	111												
3												65	130	193	56	112	224	52	129	206	46	115	230
4												86	172	258	75	149	298	69	171	275	62	154	307
5												108	216	322	94	187	374	86	215	343	77	192	383
6												129	258	386	112	224	447	103	258	412	92	230	459
8												172	344	516	150	298	597	137	343	549	123	307	613
10												215	432	644	187	374	748	172	430	686	153	383	766
12												258	516	772	224	447	894	206	516	824	184	459	918

Table 2

Instructions for Tempering Rock Drill Steels

By F. A. McLean

The ability of a drill steel to withstand breakage, the number of times it has to be sharpened, as well as its actual cutting speed depends to a large extent on proper care in heating and tempering. The nature of the steel itself, of course, also affects the shaping and tempering of bits and shanks as well as the quality and amount of work performed. There is a direct relation between this and the cost of repairs on the drilling machine.

The following instructions on drill steel treatment issued by one of the largest manufacturers of rock drilling equipment, will no doubt be useful to contractors who use rock drills from time to time.

Furnace: Oil furnaces are very satisfactory for heating drill steel for sharpening as well as for heating for tempering shanks and bits. The flame is clean, easily regulated and free from dirt and soot. The fuel is easily carried and stored and requires less space than coal or coke.

Fuel Oil: Any fuel oil will give good results when this oil is between 23° and 28° Beaume gravity. An oil with a paraffin base is the most satisfactory although an oil with an asphaltum base can be used. This oil can be bought from any of the large oil companies.

Air Pressure: The air should be throttled down by means of valve to between 15 to 20 lbs. pressure and the oil should be under 2′ to 6′ static head or pressure. This is obtained by elevating the tank so that the bottom is 2′ to 6′ above the point at which the oil is injected into the furnaces. It is important that the air should be dry and free from moisture. It is of great importance when burning oil, to take care that not too much air is introduced into the furnace or the result will be that the steel will be oxidized and prevented from taking the proper temper.

Reheating Steel for Tempering: After the steels are forged both on the bit end and on the shank end the steel should be laid aside until perfectly cool and should be reheated for tempering both shank and bit. The steel should be laid away in a dry place, not on the wet or moist ground, and allowed to cool off slowly and when the necessary quantity of steel has been sharpened or shanked, they should be heated for tempering.

Tempering the Bit: The degree of hardness on the bit depends on the hardness of the rock for which the bit is intended and no general rules can be given. The only way is to try until the right temper is secured and a good blacksmith will be able to determine this in three or four tempers. If the bits are too hard the edges will break or chip off. If too soft the cutting edges will flatten out. The best result will be obtained when the temper is just on the edge of these two conditions. For very soft rock the temper is not so important, as the range here is very much larger than when you are drilling in hard rock. For medium hard rock we would suggest heating the steel to about 1450° F. (cherry red) and if greater hardness is required raise the temperature about 25 to 50 degrees each time till the right hardness is obtained. The heating of the bit for hardening should be as short as possible and care should be taken that hardening cracks do not occur.

Water for Hardening the Bit: The water for hardening the bit should be as pure as possible. Any alkali in the water will prevent hardening and in districts where the running water contains alkali it will be necessary to use rain water contained in a tank and cool this off with the running water by a jacket of some kind surrounding the cooling tank. If very hard bits are required a strong brine solution will give you the best hardness. The brine should be kept cool by means of running water surrounding the brine tank.

Tank for Tempering the Bits: The safest way for tempering the bit is to use in the clean water or brine tank, a grating submerged below the surface of the water. The amount of submergence will depend on the section of the bit and the temper required. The steels are heated to the right temperature, placed in a perpendicular position on the top of this grating and allowed to cool. In using this method it will be necessary to circulate the cooling water which can be done either by means of a small circulating pump or by means of a small jet of air entering the bottom of the cooling tanks.

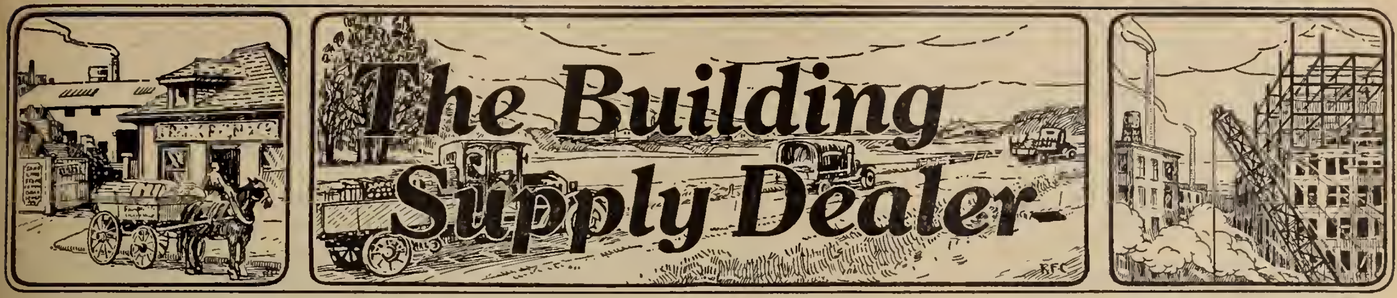
Oil Tempering Shanks: All hammer shanks should be tempered in oil. Tempering shanks is merely a quenching proposition. The best oil for this purpose is a soluble quenching oil. The temperature of this quenching oil has no important bearing on the result. We have found it to give good results between 60° and 200°. When too hot the oil will commence to smoke badly which is an indication that the oil is too hot and should be cooled down. For a small quantity of shanks a small steel tank containing from 5 to 10 gallons will be sufficient. If the oil is not agitated the steel should be moved around while cooling. If the oil is agitated which is easily done by a small jet of air the shank can be left in the oil until cool without moving. Heat the shank to be tempered, for a distance of 7″ to 9″ to about 1600 degs. (cherry red) and cool completely in the quenching oil.

Cleaning the Quenching Oil: After continuous use and due to deposit of burnt slag and oil from the steel, the quenching oil will in time become dirty. This can be removed in the following manner. Mix the quenching oil with water about half and half in a separate tank and mix thoroughly by stirring. This cleaning tank should be provided with a spigot in the bottom. Allow this mixture to settle for forty-eight hours, then tap off the water by means of the spigot in the bottom. Again mix the oil with the same quantity of water and let stand for twenty-four hours and again draw off the water. If not perfectly clean repeat this same operation once more and the quenching oil should be absolutely clean. Care should be taken not to leave any water in the mixture.

Sharpening Bits and Shanks: In forging the bits and shanks on hammer drill steel, care must be taken not to overheat the steel as the steel may become decarbonized and so unable to be tempered. If heated too high during the forging process you will get poor results on the rock and will have excessive breakage of bits, shanks and steels.

Lumber Association's New Address

The National Lumber Manufacturers' Association have removed their Washington, D.C., offices from the International Building to the Transportation Building on the corner of H St. and 17th St.



Sorting and Grading Face Brick

Practical Information for the Building Supply Dealer Who Handles Brick—Sorting Means Service

By Howard F. White*

Generally speaking, there are three kinds of brick: smooth, matt or semi rough, and the so-called rug or vertical scored. In the main there are also three grades: firsts, seconds and culls. Smooth brick are assorted more closely for shade and grade than the other textures as the imperfections are more pronounced. A smooth brick, whether stiff mud or dry press, has a shiny or glossy appearance and when chipped or marred the textural appearance is changed, which at times causes trouble. Possibly not so much today as in the past, but, a smooth brick is laid in a smaller joint which requires more plant care. It is not necessary in the rougher texture to be so careful because the brick are naturally rough and a slight imperfection on the face is not sufficient to call it an inferior grade. In other words, the textural effect is not materially changed.

What Are First Grade Brick?

Now we have arrived at a place of just what is a first grade, or a second grade, or culls. In my opinion, a truly first grade brick should be straight, good texture, and fairly uniform in shade. A second grade is somewhat crooked, faces chipped, corners marred and a wider range of color. Culls are what are left from the first and second grades, which can either be too crooked or not sufficiently burned to withstand weather conditions. There might be considered another grade known as "specials." At times when something goes wrong with the burning resulting in an off shade, we get what would be considered this class of material. These brick would hardly demand a first quality price although mechanically good, and it is therefore necessary to dispose of them at a reduced price. Then again, a plant is apt to get brick which would be considered something a little better than the second grade or culls. In that case, a higher price can be realized than a regular second grade or cull figure. Probably brick of this character are sold on small jobs and where the dealer or customer visits the plant and becomes acquainted with just what they are, or samples are submitted showing the range of color and quality.

On a normally well regulated plant making red brick three or four shades should be all that is necessary. From the top of the kiln the brick are slightly flashed, then come dark red, medium red and light red. However, if every brick were closely sorted there would be more shades, but there is always an allowable, commercial variation. Shades are more numerous in flashed brick than in clear burning and any plant is liable to get a certain amount of so-called off shades. Particularly in a rough texture where there is a good business on mingled shades, these off colors can be worked in to good advantage providing they make a proper blending. In fact, the more colors in a mixture the more beautiful the result.

Two Methods of Sorting

Generally two methods are employed in sorting: one is to wheel from the kiln to tables in the open and the other in the kiln. The latter method is in greater use. After the first few bricks are taken off the top a sorter can determine how many deep will go for a certain shade and so on to the bottom of the kiln. This method is also less expensive because it eliminates double handling. Some plants employ men that do nothing but sort, but in our own plant our sorters are wheelers and vice versa. We use no helpers in the kiln and each man has to take care of his own work.

Back of it all, there are several requisites that make for economical and efficient sorting. You must have good material, it must be properly mixed and tempered, machinery in good repair, sufficient care in hacking, and efficient setting and burning. Take a gang working a kiln that is rolled and stuck and notice their attitude. They are indifferent and lose heart. But, put them in a kiln where the brick are standing nice and straight, well manufactured and a good burn, and they are happy and glad to be working for you.

I appreciate that we cannot, or rather do not, at all times have ideal conditions and have to take bitter with the sweet, but in the process before we come to sorting, skill and care should be exercised. Then, we will get a good percentage of first class ware. Understand that I have not attempted to frame excuses or alibis for kiln workers, but, brick poorly manufactured, cannot go through the different stages and come out a first quality product. The men should be made to realize that the very existence of a plant, which means their bread and butter, depends on proper sorting and if our customers continually kick on service, prestige is lost and the inevitable will follow.

Too Much "Getting By"

The term "getting by," sad to say, is possibly too much in vogue. Can we "get by" with this or that on some order The color may be a little off or the grade not up to a standard and you take a gambler's chance. The car arrives and trouble follows. Then the unpleasantness comes of trying to straighten out the mistake. The brick may be refused and have to be hauled from the job. You have not only lost money, but destroyed your client's faith in you and your goods. When trouble of this kind arises, it is a good plan to have the superintendent, or man in charge of the loading, inspect his service and get first hand information. Let him see the folly of his way of attempting to "get by."

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*Before the Ohio Red Division of the American Face Brick Association.

To a certain extent there are two conditions that have an influence on shading and grading: one is law of supply and demand and the other labor. When demand exceeds supply and labor is scarce, the tendency is toward laxity. This is not a choice of the manufacturer, but, it is because of the independent, don't-care attitude of the men, and we, as manufacturers, cannot help ourselves and have to suffer. This gets us in bad repute and gives the industry a black eye. Sorting should be watched very carefully for it means service and service which in the end is promptness and quality is the agency on which we are to strengthen and expand our business. It is the silent advertisement of our industry.

American Construction Council has Committee on Apprenticeship

Recently the American Construction Council whose headquarters are in New York, announced the creation of a committee on apprenticeship, vocational guidance, and craftmanship with Mr. F. W. Walker, secretary of the Associated Tile Manufacturers, Beaver Falls, Pa., as its chairman. This committee cooperates with employees' and employers' organizations, building congresses, and all other elements in the construction industry, and with the educational bodies, local and national, in providing for apprenticeship which will be attractive to young men and will afford the fullest means for the employment and training of efficient workers as apprentices, and will produce the skilled workmen needed in the construction industry. A meeting of the committee will be called very shortly, probably in Buffalo during the week of December 6th.

Mason Contractors Should Study Lump Lime

Many masons prefer lump line to any other material for their work. The older men in particular are well acquainted with this material and obtain excellent results from its use. Some of the younger men, however, are not so familiar with the proper methods of handling lump line, and some times they have unfortunate experiences.

Lump lime deserves the same close attention that is given to other materials, in order to obtain the best results. A little time spent in experimenting with the brand of lime most used will be amply repaid by increased efficiency. In contrast with some other mortar and plastering materials, lump lime is obtained in concentrated form, which permits sand and water to be purchased locally at a minimum of handling costs.

There are several reasons for testing out the lime to be used, especially if it is a different brand from that to which the men on the job are accustomed. In the first place, the mortar man should know approximately how the material will slake, whether it is quick or slow-slaking, or whether it has any special action that requires a certain method of control. It is also well to know how much paste a barrel of lime will produce, and also how much the sand-carrying capacity of the paste may be increased by ageing it.

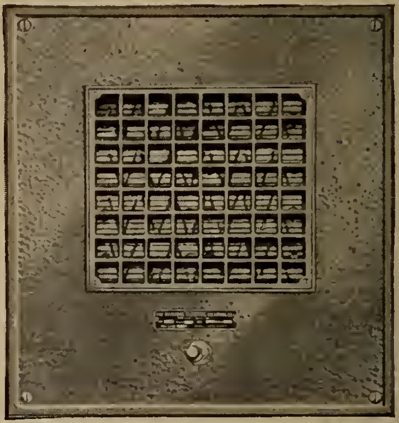
The mason contractor will do well to prepare a table for his own reference, which will give him at a glance the number of cubic feet of paste which can be obtained per barrel or ton of lump lime, and the amount of sand that a cubic foot of paste will carry at the age of two days, seven days, and fourteen days. Study should be devoted to the area covered by the sanded plaster for different types of plastering. It is well also to indicate how much lump lime is required to lay a thousand of brick or other block.

Such a table will aid materially in estimating, especially when the bid must be close. It will also help in ordering supplies and keeping the job running smoothly.

Machinery & Equipment

A Safe Electric Heater

A new product that will interest architects and contractors, and more particularly house builders, is an electric wall heater that has just been put on the market by the National Electric Heating Company, of Toronto. This heater is specially designed for bathrooms and its appearance on the market is particularly interesting in view of the serious accidents reported from time to time as a result of the promiscuous use of electric heaters in bathrooms. While it is realized that an electric heater properly installed and used is as safe in a bathroom as in any other room in the house, yet forgetfulness and carelessness is common. With this heater an accident is impossible as the heater is installed in the wall at a point out of reach of the bath; in addition to that the frame is permanently grounded. The capacity of the heater is 1,000 watts, costing one cent an hour to operate in the vicinity of Toronto. It is very handsome in appearance being finished in silver bronze or white enamel, or for special installations, as desired.

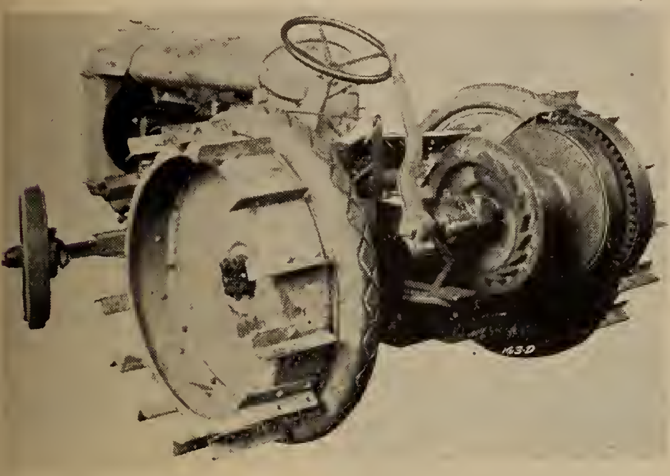


A neat and safe electric heater installation for bathrooms

Hoist Drum Attaches to Fordson Tractor

The Fordson tractor hoist attachment, shown in the accompanying illustration, is a product of the Clyde Iron Works of Duluth, Minn. It consists of a friction drum supported in a cast steel frame and is fastened to the tractor by eight of the same bolts that connect the rear axle housing and the transmission housing and two bolts through the two outside holes in the drawbar cap just below the operator's seat.

The drum is 8" in diameter and 10" long between flanges which are 18" in diameter. It is friction driven, having the Clyde standard wood cone frictions and thrust mechanism; has long bronze bushings with grease cup lubrication, and is equipped with a foot-lever operated, asbestos-lined band brake and ratchet and pawl. The hoist attachment is so mounted that the drawbar can be used for hauling without removing any part of the hoist.


Hoist attaches to but does not interfere with Fordson Tractor

The gearing is of steel with machine cut teeth. Power is supplied through a roller chain drive and sprockets from the pulley shaft of the Fordson. A rod placed on the lever side of the drum gives the operator full control of the throttle from his regular position.

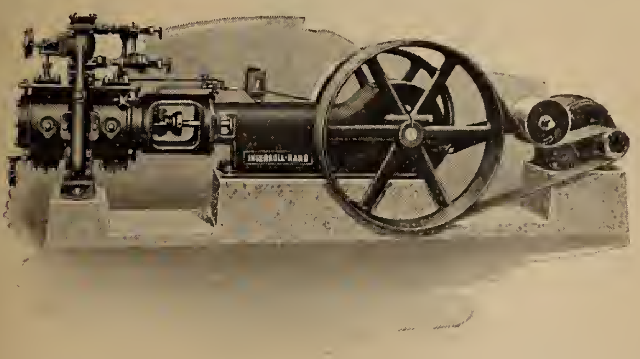
All shaft bearings are babbitted and lubricated with grease cups, the drum shaft bearings being equipped with removable caps.

The line pull of the attachment is 3,900 lbs at 142 ft. per minute, when the first layer of half inch cable is on the drum. When the last or seventh layer of cable is on the drum, the line pull is 2,320 lbs. at 242 f.p.m.

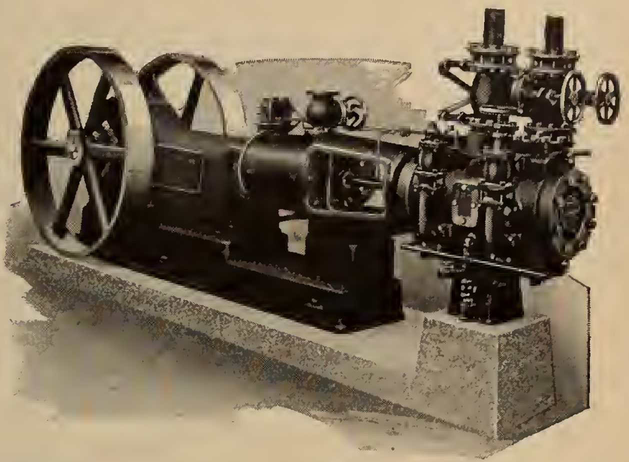
A New Line of Small Ammonia Compressors

A new line of Canadian-built ammonia compressors in sizes of 2.5 to 42 tons has recently been placed on the market by the Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal.

These small ammonia compressors embody all of the features that have been associated with Ingersoll-Rand air and gas compressors which have been on the market for over fifty years. These features, including plate valves for ammonia inlet and discharge, exceptionally large valve and port areas, enclosed frame construction with automatic lubrication, etc., enable the users of small ammonia compressors to obtain the same efficiencies as those attained by large plants.


Ingersoll-Rand class "ERA-1" ammonia-compressor with short belt motor drive attachment

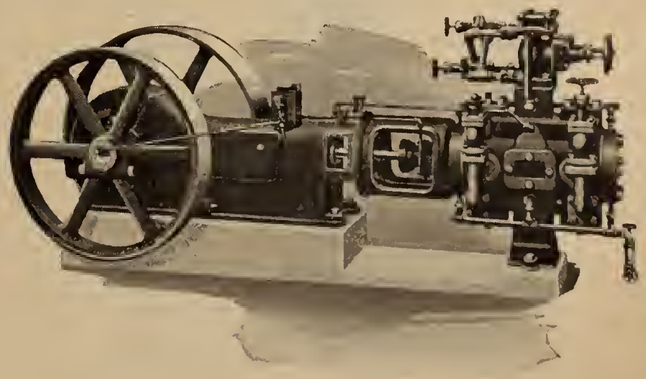
The light, high speed, automatic action of the valves, improved cylinder construction and the rugged, well protected, properly lubricated driving ends, permit higher speeds with resultant increase in tonnage per horsepower, and per foot of floor space occupied.


Ingersoll-Rand class "FRA-1" straight-line, steam-driven, single-stage, double-acting ammonia compressor

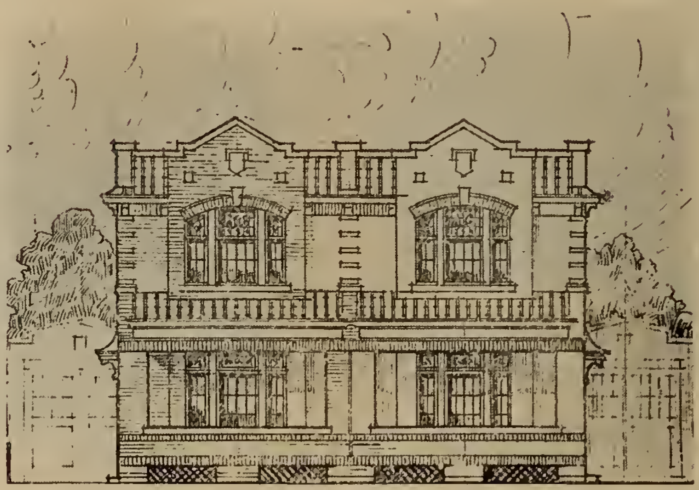
These new machines are of the enclosed, horizontal, straight-line, center-crank type with single-stage, double acting ammonia cylinders. The design of the frame, crank-shaft, crosshead and other running parts is identical with that of the small air and gas compressors and vacuum pumps manufactured by the Canadian Ingersoll-Rand Company.

The Class "ERA-1" ammonia compressors are arranged for long belt or short belt drive. The smaller sizes can also be equipped with tight and loose pulleys when desired.

The class "FRA-1" steam-driven units are equipped with a simple piston valve steam cylinder placed between the ammonia cylinder and frame. The piston valve is of the Ingersoll-Rand balanced type, (similar to those used on modern locomotives) and together with the wide-range automatic cut-off governor provides for better steam economy than has hitherto been obtainable from small steam-driven machines. With this valve the valve chest gland is subject to exhaust pressure only.


Ingersoll-Rand class "ERA-1" straight-line, belt-driven, single-stage, double-acting ammonia compressor

The Contract Record's
Weekly House Suggestion No. 90



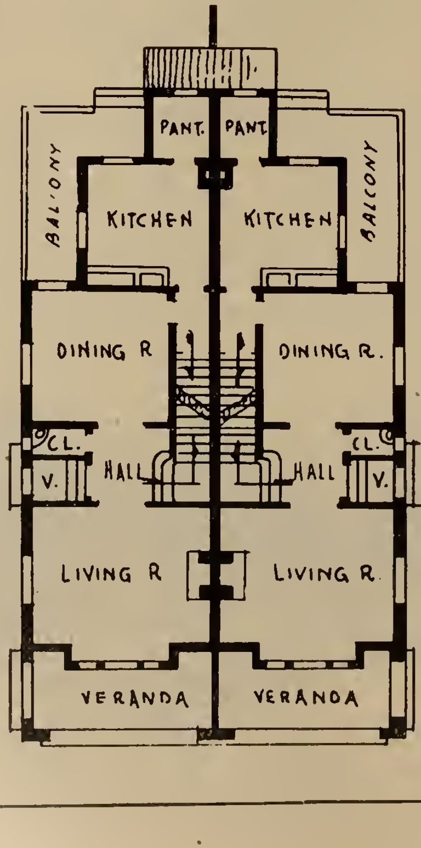
The plans illustrated in this week's issue are those of a semi-detached house which was designed by Mr. J. A. S. Houle, architect of Montreal. This house including the garages, was built on a 50′ x 100′ lot,, the dimensions of the house being 34′ frontage by 33′ in depth with a 24′ x 11′ extension at the rear.

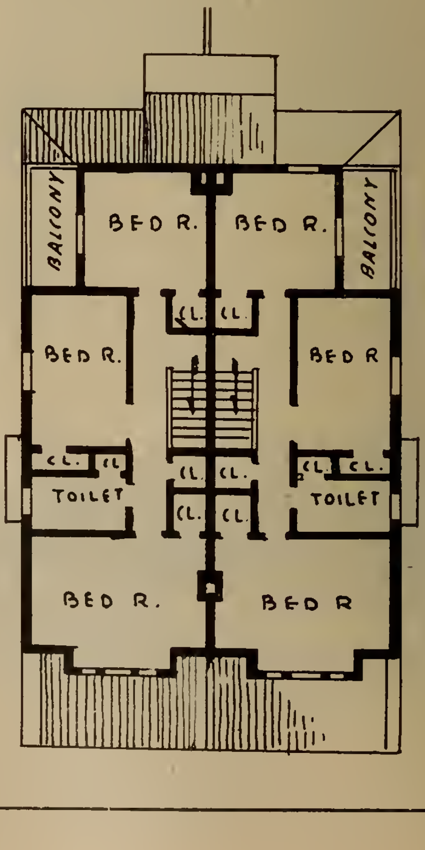
The ground floor comprises a 16′ x 12′ living room, a 12′ 3″ x 11′ 9″ dining room and an 11′ x 10½′ kitchen. There is a 6′ x 3′ closet near the entrance. The hall measures 7′ x 7′ and the vestibule 6′ x 4½′. Besides the spacious front verandah measuring 17′ x 8′, there is also a verandah at the rear. A cold storage room connects with the kitchen, and there is a side entrance to the cellar under the main entrance.

There are three bedrooms on the upper floor, each provided with closets, and a linen cupboard in the hall.

The house foundations are of cement and the walls of wood and brick. All interior woodwork is of B. C. fir with plastered walls. The floors are made of red pine.

The garages measure 20′ x 12′ and have flat roofs and cement walls. This house was built at a cost of $12,500 and includes a hot air heating system.





Mainly Constructional

East and West—From Coast to Coast

Forshner Bros., contractors, of Muenster, Sask., have dissolved partnership.

Crushed Stone, Ltd., of Toronto, have moved their offices from the Yonge St. Arcade to room 216 Harland-Smith Building, at the corner of Bay and Adelaide Streets.

Messrs. DeWolf and Ham, construction engineers, of Cranbrook, B. C., have moved their offices from Baker street to the Townsite Building.

Recent announcements state that the Dominion Government plan the erection of large storage elevators at Edmonton and Halifax.

The main mill of the United Shingle Company's plant on Columbia Street, New Westminster, B. C., was destroyed by fire recently. The loss is estimated at $50,000, which is fully covered by insurance. The kilns, shipping shed and boiler room were saved. J. A. McKerchar, 1050 Gilford Street, Vancouver, is the owner of the plant.

Recent reports that the Stephens Construction Company, of Campbellton, N. B., were in financial difficulties and that their plant had been seized by the Bank of Nova Scotia, have been officially denied by an official of the company who states that the company has experienced no financial trouble of any kind and that their assets are greatly in excess of their liabilities.

The city of Quebec will seek to borrow $300,000 from the provincial government to finance the construction of workingmen's dwellings. This is one of the requests that will be made at the approaching session of the government.

The drive for funds for the erection of a Masonic Memorial Temple at Montreal has been over subscribed by $212,000, the sum of $712,000 having been collected for this purpose. The site for the new temple has not been selected as yet, but a special committee will decide on this as soon as an expression of opinion has been obtained from the members as to the district desired.

The Brantford Roofing Co. Ltd., of Brantford, Ont., has taken over the Canadian Roofing Mfg. Co., of Windsor, Ont., and the machinery of the Windsor company will be installed in the additions erected to the Brantford plant this summer. Mr. C. S. Jackson, general manager of the Windsor concern, becomes sales manager of the new company, which now lays claim to the title of the largest manufacturers of asphalt roofings in Canada.

On the ground that not to accept the lowest tender would be establishing a dangerous precedent which might injure industry in the city in the future, the Board of Control at Toronto, by a majority of one, recently awarded the contract for over $200,000 worth of cast iron piping to a British firm. The tender of the National Iron Corporation, a local company, was approximately $20,000 higher.

The Engineering Institute of Canada has offered three additional prizes to its student members who are attending Toronto University. For the three best papers on some technical or engineering subject, submitted before January 31, to Professor T. R. Loudon, of the Faculty of Applied Science, the sums of $25, $15, and $10 will be given.

The Peterboro branch of the Engineering Institute of Canada held its annual dinner recently, when several prominent engineers addressed the gathering. Mr. D. W. McLachlan, M.E.I.C., engineer in charge of the proposed St. Lawrence ship canal, explained the plans for developing that route to the sea. Other speakers were Messrs. W. J. Francis, president of the Canadian Institute; Fraser S. Keith, secretary; J. M. Oxley and T. H. Hogg, of Toronto; J. L. Rannie, Ottawa; F. S. Lazier, Niagara Peninsula; De Gaspe Beaubien, Montreal, and G. N. Gordon, K.C., M.P. Mr. Ross L. Dobbin, president of the local branch, was in the chair.

Personal

Mr. Louis Chevalier has started a contracting business at Delmas, Sask.

Mr. W. L. McFaul, city engineer of Hamilton, attended the recent municipal convention in Atlanta, Georgia.

Mr. Walter Herd has been appointed chief mining engineer of the British Empire Steel Corporation, Sydney, N. S., and will have jurisdiction over all mines and mining property of the main and subsidiary companies.

Mr. W. S. Ewens has been appointed manager of the Ontario district sales organization of the Sangamo Electric Company of Canada, Limited, and the Wagner Electric Manufacturing Company of Canada, succeeding Mr. R. M. Scrivener who resigned to become special agent for the Wagner Electric Corporation, of St. Louis, Mo. Mr. Ewens is a graduate of McGill University and has spent many years with the Canadian Westinghouse Company and the Northern Electric Company.

Obituary

Mr. Edward Maxwell, R.C.A., one of America's most prominent architects, died very suddenly at his residence, 312 Peel St., a few days ago. Mr. Maxwell was the son of the late E. J. Maxwell, lumber merchant, and was born in Montreal on December 31, 1867. He received his early education at the Montreal High School. His architectural career was started in the office of the late A. F. Dunlop. Later he went to Boston and was associated with the firm of Shepley, Rutan & Coolidge, returning in 1892 to take up practice in Montreal. In 1903 he founded the well-known firm of Edward & W. S. Maxwell. As memorials of his talent and energy Mr. Maxwell leaves some of the best known architectural achievements throughout the Dominion, in monumental and commercial buildings, churches, city residences, country estates and monuments, including the Art Association Building, Montreal; Legislative and Executive Buildings, Regina; Royal Alexandra Hospital, Montreal; Montreal General Hospital; Nurses' Home, Royal Victoria Hospital; the Church of the Messiah; Montreal High School; Montreal Stock Exchange; Merchants Bank Building; Canadian Pacific Railway hotels at Winnipeg, Calgary, Vancouver, and the Chateau Frontenac at Quebec; the city residences of the general manager of the Bank of Montreal, C. R. Hosmer, the late R. B. Angus, the late Senator Forget, J. T. Davis, and Sir Vincent Meredith.

Trade Incorporations

Belanger Papineau, Limitee, with head office at Cornwall, Ont., capital $100,000, to carry on an engineering and contracting business.

Ideal Housing Co. Ltd., with head office at Aylmer, P. Q., capital $20,000, to carry on a building and real estate business.

The National Marble, Limited, with head office at L'Annonciation, P. Q., capital $149,000, to quarry and deal in marble and other products.

Metropolitan Contractors, Limited, with head office at Montreal, capital $25,000, to manufacture tools, woodworking machinery, etc.

CONSTRUCTIONAL ACTIVITY

Period of November 21 to November 27, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Hamilton, Ont.
The city council contemplate opening and improving the following streets; Dunsmure Rd. from Roxboro Gardens limit to Beaconsfield Park addition. Work will start this fall or early spring. W. L. McFaul is the engineer in charge of work.

The laying of sewers in Hunter St. from Ferguson Ave. to Walnut St., and Robert St. from James to John St., is proposed by the city council.

The city council contemplate paving Bowen St. from Jackson St. to Main St., and Main St. rom Kenilworth Ave. to city limits.

Headingly, Man.
A. Melville, 5 National Trust Bldg., Winnipeg, is preparing plans of a sewage disposal system here. Owner is J. Kenaston, Minneapolis, Minn.
Contracts Awarded

Hespeler, Ont.
Tenders have been received by the town council for waterworks extension.

Laprarie-Lacolle Highway, Que.
Tenders are being received by the Dept. of Public Highways, through the deputy minister, J. L. Boulanger, Parliament Bldgs., Quebec, for the resurfacing with an oiled waterbound macadam of 4,074 feet of roadway.

Mosa Twp., Ont.
The township council contemplate a drainage system here.

Simcoe, Ont.
Plans are being prepared for sanitary sewer extension on Victoria St. from Sherman to Pond. G. R. Marston is the engineer.

CONTRACTS AWARDED

Ellice Twp., Ont.,
The contract for drain improvements has been awarded by the township council to John F. Crowley, R. D. No. 1 Sebringville, at $3,073.

Niagara Falls, Ont.
Contract for sewer work has been awarded by the city council to J. H. McKnight Construction Co., Ltd., Toronto. Earth excavation $1.70 per cu ft.; rock excavation $6.00 cu. ft.

Portage La Prairie, Man.
The contract for outfall sewer has been awarded to Fowler, Young & Holden Co., Ltd., Winnipeg, at $77,475.

Toronto, Ont.
The contract for iron pipe has been awarded by the city of Toronto to Francis Hankin & Co., Ltd., 386 King St. W., at $228,219.75.

Winnipeg, Man.
Thos. Jackson & Sons, 370 Colony St., have been awarded the contract for sewers at $3,200.80.

Railroads, Bridges and Wharves

Dartmouth, N. S.
Tenders are being received till December 18, by Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for construction of a wharf here. Plans and specifications at offices of the district engineers, Bellevue building, Halifax, Custom House Bldg., St. John, N. B., and at Post Office, Dartmouth, N. S. A 10% accepted cheque required.

Niagara Falls, Ont.
Tenders are being received till December 1 by superintendent, J. H. Jackson, for the construction of 2 concrete arch bridges in Queen Victoria Park. Plans and specifications with owner. Queen Victoria Park Commission. A 5% accepted cheque required.

Three Rivers, Que.
Oscar Arcand, 476 Notre Dame St. has been appointed engineer in charge ot rebuilding bridges on St. Maurice River. Cost of this work will be $160,000.

Yamachiche, Que.
New plans are to be prepared for $10,000 concrete bridge over River Yamachiche. Ivan E. Vallee, Quebec, Que., is the engineer in charge of work.

CONTRACTS AWARDED

Baie St. Paul, Que.
Methot & Fournier, Montmagny, Que., have been awarded the contract for construction of wharf in River du Gouffre, at $11,068.75.

Cocagne Cape, N. B.
John W. McManus Co., Memramcook, have been awarded the general contract for wharf and roadway approach at $12,910.

St. Louis de Terrebonne, Que.
Belanger & Sicotte, 83 Craig West, Montreal, have been awarded the general contract for $60,000 bridge to be erected between St Louis de Terrebonne and Ste. Rose de Laval, Que. Engineer in charge of this work is Ivan E. Vallee.

Toronto, Ont.
Roger Miller & Sons, Ltd., Lumsden Bldg., have been awarded the general contract for grading work for Toronto Suburban Railway Company.

York Twp., Ont.
Work is in progress for construction of $80,000 concrete arch bridge at Governors Rd. Contract for waterproofing has been let to Western Waterproofing Co., Toronto. Goldie Construction Co., are the general contractors. F. J. Engholm, 56 Huntley St., Toronto, is the engineer.

Public Buildings, Churches and Schools

Gaspe, Que.
Pierre Levesque, 115 St. John St. Quebec City, is preparing plans for a fireproof seminary at Gaspe, to cost $125,000.

Halifax, N. S.
Childrens Hospital Board contemplate an addition to Childrens Hospital to cost $50,000.

Jonquierre, Que.
The building of a new school is contemplated by the School Board. 3 stories, 32 x 52, brick veneer construction.

Kingston, Ont.
Sealed tenders will be received by the registrar, W. E. McNeil, till December 12, for interior finished woodwork and ornamental iron work required for the library building of Queen's University. A marked cheque to the order of the treasurer, Queen's University, for 5% of amount of tender is required. Drawings and specifications may be seen at the offices of the registrar in Kingston and the Bulders' Exchange, Toronto, or they may be had upon deposit of $15.00 by applying to the architects, Shepard & Calvin, 36 Toronto St., Toronto.

Limoilou, Que.
Lorenzo Auger, 39 St. John St., Quebec, Que., is preparing plans of public parish hall to be built on 8th Ave.

Montreal, Que.
Chas Davis, 3 Burnside Place, is preparing plans of school to be built corner Hadley and Jacques Hertel for R. C. School Commission.

Megantic, Que.
The school board contemplate the erection of a school here. 3 storeys 40 x 50, brick veneer construction.

Ottawa, Ont.
The erection of a $50,000 civic building on Canal St., is proposed by the city council.

Rosetown, Sask.
A By-law is to be submitted on December 10 for $50,000 addition to hospital.

St. Maxime de Scott, Que.
Jos. P. Ouellet, 28 St. Famille, Quebec, Que., is preparing plans for completion of interior of church for R. C. Parish. Tenders will be called in about one month.

St. Martin, Que.
The School Board contemplate building a new school here.

St. Alphonse de Caplan, Que.
The R. C. Parish contemplate building a $50,000 church here. Curate is

Rev. Bouillon, New Carlisle, Que. No materials purchased.

St. Hilarion, Que.
Wilfrid Lacroix, 132 St. Peter St., Quebec, Que., is preparing plans of $100,000 church here. Owner and curate is Rev. Philippe Tremblay.

St. Catharines, Ont.
The city council contemplate building a stadium corner Woodland and Maple Sts., estimated to cost $30,000. J. A. Pay is the engineer in charge. Work will start in spring.

Three Rivers, Que.
Asselin & Denoncourt, 42 Alexandre St., are preparing plans of $55,000 residence for Brothers to be built on St. Philippe St. City council is the owner. No. Materials purchased. 3 storeys, 32 x 100, brick construction.

Timmins, Ont.
Frank Valois, Timmins, Ont., has the painting contract on $120,000 high school being built here. Schultz Bros. & Co., Ltd., 35 Albion St., Brantford, are the general contractors, Architects Pennington & Boyd, Windsor; associate architect, J. W. Leighton, Windsor.

Toronto, Ont.
The walls are up for $100,000 addition to Methodist church at 310 Danforth Ave. Electric and plastering trades to be let. Architects, G. M. Miller & Co., 93 Yonge St.

Varennes, Que.
Tenders are being received till December 1 by the architect, Raoul Gariepy, 15 St. James St., Montreal, for addition to convent owned by Soeurs Ste. Croix. Plans and specifications with architect.

Weston, Ont.
Mason Lodge No. 523 contemplate building a hall on Main St. 1 storey, brick construction. Building Committee is S. J. Totten and C. Lorne Fraser.

Weedon, Que.
J. W. Gregorie, 16 Wellington St., Sherbrooke, Que., is preparing plans of $8,000 church and rectory for R. C. Parish. Tenders for this work will be called in about three weeks.

CONTRACTS AWARDED

Brandon, Man.
The following sub-trades have been let on hospital being built here; millwork—Brown & Rutherford, Winnipeg, at $10,700; ornamental iron and bronze —Vulcan Iron Works, Ltd., at $26,900.

Burns Lake, B. C.
Brown & Robb are the general contractors of $14,990 school to be built here.

Caledonia, Ont.
Foundations are going in for High school being built here. Contract for steel work has been let to Hamilton Bridge Works Co., Ltd., Toronto. W. W. Petley & Co., Toronto, are the general contractors. Architects, Walker & Gibson, 82 King St. E., Toronto.

Claremont, Ont.
Geo. Hubbert, 195 James St., Toronto, has the contract for painting, and Hobbs Mfg. Co., the contract for glass and glazing in connection with $35,000 school being built here. General contractors are W. W. Petley & Co. Architects, Walker & Gibson.

Edmonton, Alta.
City of Edmonton has awarded Mount Royal Metal Company, Montreal, Que., the contract for lead pipe at $3,448.50.

London, Ont.
The following sub-trades have been on $18,000 parish hall being built for St. George Anglican Church; brickwork—R. N. Southern, 20 Renwick Ave.; steel—London Bridge Ltd. W. E. Dodd, 448 King St., London, is the general contractor. Architect John M. Moore, 449 Richmond St.

Lewis Bros., 179 Mill St., have the contract for painting $250,000 science building being erected for Western University. Jno M. Moore, architect, 489 Richmond St., wants prices immediately on laboratory equipment, estimated cost $50,000. General contractor is Jno. Putherbough, 96 Talbot St.

The following sub-trades have been let on $50,000 sunday school and gymnasium for Knox Church Congregation; plastering—Slade & McWain; electric—Bowley Electric Co.; painting—J. C. Fitzgerals, 585 Princess Ave. L. B. Kerr, 196 Simcoe St., is the general contractor. Architect. W. G. Murray, Dominion Savings Building.

Montreal, Que.
The following sub-trades have been let on $90,000 hospital being built for Souers de la Misericorde; roofing—M. Chouinard, 751 Adam St.; plumbing, heating, ventilating and skylights—J. A. Francoeur & Cie.; plastering—G. Rochefort, 273 Valois; ornamental iron and fire escapes— Montreal Architectural Iron Works, Ltd.; elevators—Otis Fensom Elevator Co, Ltd. Painting and glazing by general contractors, Ulric Boileau, Ltd. Refrigerators, marble and tiling to be let. Architect, J. E. C. Daoust, 180 St. James St.

Following sub-trades have been let on $65,000 convent being built here for Sisters of Immacuile Conception; roofing, plumbing, heating and ventilating—J. E. Hardy, 1470 Papineau; plastering—G. Rochefort, 273 Valois; slate—E. LePage, 990 Parthenais; painting and glazing—Bruno Navert, 1229 St. Dennis. Architect, Jos Sawyer, 407 Guy St.

Brickwork is going up for $42,250 presbytery on Dorion St. for Parish Ste. Marguerite-Marie-Alacoque. Following sub-trades have been let; millwork—H. Chagnon & Cie.; roofing—M. Chouinard, 751 Adam St.; electric— J. A. St. Amour, 2171 St. Denis; plastering—G. Rochefort, 273 Valois. Tiling to be let. Painting and Glazing by general contractors, Ulric Boileau Ltee. Architect, E. A. Doucet, 195 St. Catherine E; associate architect, Ernest Cormier.

Outremont, Que.
The following sub-trades have been let on school being built on Lajoie Ave.; marble and tiling—Brown & Son; roofing—Wm. Rutherford & Son Co., Ltd.; Plastering—C.Hayward, 226 Regent St. McRitchie & Black, 14 Sussex Ave. are the general contractors. Architects, MacVicar & Herior, 628 Union St.

Ottawa, Ont.
Contract for building botanical laboratory has been awarded to Taylor & Lackey, Trust Bldg., at $24,084.

Springhill, N. S.
W. A. Munro & Sons, Paradise Row, St. John, are the general contractors for $15,000 rink being built on Junction Rd.

St. Lambert, Que.
R. J. Williams, 13 Prince Arthur St., has been awarded the contract for plumbing and heating for $34,350 Fire and Police station, at $4,738. General contractors are Duranceau & Duranceau, Montreal. I. Kellett is the engineer in charge of work.

St. Catharines, Ont.
The walls are going up for $130,000 terminal building corner Geneva St. and Welland Ave. The following sub-trades have been let; steel—Hamilton Bridge Works Co., Ltd.; reinforced steel—Lefroy Engineering Co., Ltd. General contractors are Frid Construction Co., Hamilton.

Sudbury, Ont.
Work is in progress for $100,000 church being built on Beech St., for R. C. Episcopal Corporation of the Diocese of Sault Ste. Marie. Grant & Hiscock have the contract for plumbing. Architect, P. J. O'Connor, Stafford Block.

Saskatoon, Sask.
The following contracts have been awarded on Tuberculosis Sanitarium to be built here; general contract—Smith Bros. & Wilson Ltd., Regina, at $181,000; structural steel—Dominion Bridge Co. Ltd., Winnipeg, $75,321; ornamental iron—Dominion Bronze & Iron Ltd, Winnipeg, $38,280; electric—Sun Electric Co., Ltd., Regina, $18,495; plumbing and heating—Northern Plumbing Co., Saskatoon, $77,767; lath and plaster —George Pinder, Saskatoon, $26,748; painting—Robinson & Co., Regina, $29,400; tile—Regina Marble & Tile Co., Ltd., $13,460; roofing and sheet metal—A. L. Charlebois, Saskatoon, $24,395.

Waterville, N. S.
E. R. Goucher, Berwick, N. S. has the contract for electric work on $12,000 church being built for Methodist & Presbyterian Union Comm. Balance of work by general contractors, J. H. Hicks & Son, Bridgetown, N. S.

West London, Ont.
The following sub-trades have been let on $300,000 arena being built here; roofing—Brownlee Hardware Co.; electric—Knowles Electrical Co.; painting—W. T. Page, 251 Ridout St.; tile- Ontario Denison Tile Co, Ltd., Windsor, Ont.

Windsor, Ont.
Couloutti Bros., 612 Langlois Ave., have the contract for terrazzo work and Pennington & Lang the contract for roofing on separate school being built on Campbell Ave. Muxlow & Gale are the general contractors. Architect, G. J. P. Jacques.

Business Buildings and Industrial Plants

Cereal, Alta.
Work has commenced for repairs to grain elevators costing $8,000. United Grain Growers, Ltd., Calgary, are the owners and will purchase materials and sub-let trades.

Chemainus, B. C.
Victoria Lumber Mfg. Co., are having

plans prepared for the erection of a lumber mill here.

Hamilton, Ont.
Wm. Carroll, 19 Hughson St. S., contemplates building a $60,000 warehouse on Humber St. between Bailey and Walnut.

Kingston, Ont.
The Dye & Chemical Co. of Canada, Ltd., contemplate building a factory here, to cost $25,000.

R. W. Catto, 47 King West, Toronto, is preparing plans of an hotel to be erected here. 7 storeys and basement, 190 x 70, reinforced concrete construction.

Lachine, Que.
Frank Penden, 65 McGill College Ave., Montreal, is preparing plans of $50,000 club house for Lachine Links Construction Co., Ltd., 26 Victoria Sq., Montreal.

Mitchell, Ont.
Burritt Knitting Mills contemplate an extension to their factory here.

Orillia, Ont.
Canada Wood Specialty Co., Ltd., contemplate building an $85,000 factory corner Front and Coldwater Sts.

Riviere De Loup, Que.
Lorenzo Auger, 39 St. John St. Quebec, is preparing plans of a hall for Knights of Columbus.

St. Catharines, Ont.
Nicholson & MacBeth, 46 Queen St., are preparing plans of stores, offices and lodge, to cost $50,000, for Union Lodge, I.O.O.F. No. 16. Tenders are being received by architects, till December 17. Plans and specifications with architects.

Toronto, Ont.
Canadian Bank of Commerce has purchased a site on north west corner North Yonge and Elginton Ave. for erection of branch bank.

The walls are going up for $15,000 brick plant corner Spears and Northland Aves., owned by Hinde Bros., 134 Northland Ave. Work day labor by owners.

Walls are going up for $150,000 addition to lunch room at 11-13 King East. Roofing, plastering and painting trades to be let. W. T. Joy, 86 High Park Ave. is the general contractor. Architects, N. A Armstrong Co., Ltd.

CONTRACTS AWARDED

Brockville, Ont.
Following sub-trades have been let on 3 stores and apartments being built north side King West between Court House Ave. and Buell St., for E. Cancilla, 170 King West; roofing—Henry Bedard & Son; heating—John Semple; painting—John Carberry. Electric and plastering to be let. W. E. Brown, 141 King West is the general contractor.

Ford, Ont.
Merlo, Merlo & Ray, have the contract for excavation work for $35,000 branch bank of Provincial Bank of Canada. Windsor Construction Co., Ltd., Walkerville, are the general contractors. Architect, G. J. P. Jacques, 3 Ouellette Ave. Plastering, painting, electric, plumbing and heating to be let.

Hamilton, Ont.
Thos. Irwin & Son, 22 McNab St., have the roofing contract for $15,060 store and office building being built corner Kenilworth and Barton Sts. Donaldson & Patterson, 229 Bay S., are the general contractors.

Kirkland Lake, Ont.
F. R. Gibson, Haileybury, Ont., has the contract for plumbing and heating of branch bank being built here for Imperial Bank of Canada. Electric, plastering and painting by general contractors, Hill, Clarke & Francis, New Liskeard. Architect, W. L. Somerville, 2 Bloor W., Toronto.

Montreal, Que.
M. Robert, 627 Mount Royal East, is owner and builder of $12,000 store at 329 Delaroche. Foundations and brickwork—C. Frenette, 331 Delaroche. Carpentry, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

General contract for garage to be built on St. Lawrence near Mile End Station, has been awarded to Jules Taralli, 186 St. Margaret, at $70,000, and not to N. Block, 207 Wellington as previous reported. Owner is M. Block 207 Wellington.

Ottawa, Ont.
Doran Construction Co., Ltd., 104 Sparks St., have the general contract for $7,000 warehouse on Copper St. for Snelling Paper Sales. 25,000 bricks and materials for 70 cu. yds. of concrete required.

Toronto, Ont.
John Cummings, 417 Beresford Ave., has the general contract for garage and service station to be built on Dundas St. W. near Watkinson Ave., for Cummings & Bunt, 2742 Dundas West. Carpentry day labor. Masonry, roofing, electric and structural steel to be let.

Tile walls are going up for $50,000 ice plant on Browns Ave. for Chapmans Ltd. Following sub-trades have been let; electric—Salisbury Electric Co, Ltd.; heating and plumbing—Sheppard & Abbott. General contractors are Witchall & Son. Architects, Chapman & Oxley.

The walls are going up for $175,000 office building corner Gerrard and Yonge Sts, for Canada Life Assurance Co. Contract for millwork has been let to R. Laidlaw Lumber Co., Ltd. General contractors are P. H. Secord & Sons Construction Co., Ltd. Architects are Sproatt & Rolph.

Dowling & Williams, 167 Yonge St., have been awarded the general contract for $125,000 light manufacturing building to be built at 207-215 Richmond West, for Gelber Bros. Ltd. Architect, Benj. Brown, 287 Spadina Ave.

The foundations are going in for addition to Capital theatre, stores and offices, corner Castlefield Ave. and Yonge St. Followng sub-trades have been let; masonry—J. Copp, 31 Balmoral Ave; steel—McGregor & McIntyre; stone—J. H. Jackson, Shaftsbury Ave. Carpentry day labor. Oother trades still to be let. Owner is R. McClelland, Capital theatre. Architect, Murray Brown, Confederation Life Bldg.

Work is in progress on alterations to store for cafeteria, 185 Yonge St. Following sub-trades have been let; terrazzo floors—Italian Mosaic & Marble Co.; rubber floors—Canadian I. T. S. Rubber Co. Painting to be let.

Hocken & Kelly, Dovercourt Rd., have the contract for masonry work on $13,000 public garage at 1882-4 Yonge St., owned by McCann Bros. Carpentry day labor. Heating and plumbing by owners. Plastering, electric and painting to be let.

Foley & McTague, 89 Malvern Ave., and David McKay 287 Ashdale, the concrete and brckwork for $10,000 theatre north east corner Woodbine and Danforth Aves. W. A. Summerville, 478 Danforth Ave. is the owner. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade.

Vancouver, B. C.
H. H. Fisher, 305 Pender St. W., has the general contract for repairs to bank building on Hastings St. W.

Weston, Ont.
C. Brookbanks is the general contractor for $12,000 drug store to be built on Main St., corner John, for W. J. Inch, Main St.

Residences

Anerdon Twp., Ont.
The walls are going up for $25,000 residence on River Front. Owner and architect is John J. Comerford, care Detroit Lumber Co., Detroit, Mich., and looks after all work.

Bagotville, Que.
Armand Simard, Bagot St., is the owner of $18,000 store and residence being built on Bagot St.

Bulyea, Sask.
Storey & Van Egmond, Regina, Sask., are preparing plans of $9,000 residence to be built here. Math Anderson, of Bulyea, is owner and general contractor.

Hamilton, Ont.
W. T. Dyment, 895 King E. contemplates building a number of residences on Crosthwaite Ave., Beaconsfield Park, and will let trades.

Witt, Bull & Oxford, 124 Edgemont, will build 16 residences on Cameron Ave. and will let trades.

Excavation work is being done for $10,000 residence on Flatt Ave. Wm. Inrigg, 160 Flatt Ave., is the owner and general contractor and is receiving tenders on all trades. No material purchased except brick.

John McQuillan, 668 Main East, contemplates building 21 residences on Cameron Ave., in Roxborough Gardens. Roofing, electric, heating, plumbing, plastering and painting to be let by owner. No materials purchased.

Work has started for 3 residences, $12,000 being built on Maple Avenue. Owner and general contractor is Ellis V. Atkinson, Turner Bldg.

London, Ont.
Tenders are being received till December 1 by the architect, John M. Moore, 489 Richmond St., for remodelling residence for apartments, costing $12,000.

Plans and specifications with architect. Prices wanted on all materials.

Montreal, Que.

W. Lariviere, 1422 Blvd. Gouin, is owner and general contractor of 2 residences, $9,000, on Vianney Ave. near Blvd. Gouin. Painting and carpentry by day labor. Electric, plumbing, plastering, roofing and masonry to be let. No materials purchased.

F. Iddon, 234 Notre Dame de Grace Ave. is owner and builder of 3 residences, $20,000, on Mayfair between Terrebonne and Monkland. Masonry, millwork, roofing, plastering, heating, plumbing, painting and glazing to be let.

L. Jerome, 3045 St. Dominique, is owner and builder of 2 residences, $12,000, on Henri Julien between Villeray and 32nd Ave. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Foundations are going in for 2 residences, $12,000 on Esplanade, Ave. Wm. Deslauriers, 469 Old Orchard, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Excavation work is being done for 3 flats, $10,000, near 4331 Notre Dame St. E. A. Lefebvre, 4331 Notre Dame E. is the owner and builder. Architect, J. A. Robert, 293 Workman. Brickwork, millwork, roofing, electric, plumbing, heating and plastering to be let.

Alex. Bremner, 229 St. Catherine Rd., is owner and builder of 2 cottages, $18,000, on St. Catherine Rd., corner Laurier Ave., and will let sub-trades privately.

Excavation work is being done for $15,000 residence on Prudhomme, between Sherbrooke and Cote St. Antoine. Architect is J. A. Robert, 293 Workman. Owner and builder, E. Berthiaume, 132 Joliette. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing and tiling trades to be let.

Lancashire Land & Construction Co. are the owners and builders of 4 residences, $28,000, on Marcil, near Notre Dame de Grace Ave. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing and tiling to be let.

Excavation work is being done for $21,000 residence on Laurier, corner Fabre. A. & D. Boileau, 245 McDougall Ave., are the owners and builders. Masonry, millwork, roofing, painting, plastering, plumbing, heating, glazing and electric to be let.

L. Doyon, 334 Decarie Blvd., is owner and builder of 2 residences, $15,000, on Brillon, between Marlowe and Northcliffe. Sub-trades to be let.

J. Hand, 4857 Sherbrooke W., is the owner and builder of $20,000 residence opposite 916 Grosvenor Ave. Millwork, roofing, electric and tiling to be let.

Excavation work is being done for $15,000 residence on Chambord, between Beaubien and St. Zotique. G. Rathelade, 53 Marquette, is owner and builder. Roofing, electric, plumbing and plastering to be let. Masonry, carpentry and painting by day labor.

Foundations are going in for $9,000 residence on Alma, north east corner Belanger. Owner and builder is A. Gagnon, 27 Belanger. No materials purchased. Millwork, roofing, electric, plumbing and plastering to be let. Brickwork by owner.

Foundations are in for 4 residences, $20,000, on Wurtele, between 36th and 40th Avenues. R. Lortie, 36 Wortele, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Jos. Giguere, 402 St. Catherine East, is the owner and builder of 3 residences, $18,000 on St. Denis, between 34th and 35th Avenues. Brickwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

Mimico, Ont.

W. A. Goy, 144 Northcliffe Blvd., Toronto, is owner of 2 residences, $3,500 each, being built on Albani St. Masonry, plastering, electric, plumbing and heating to be let. Carpentry by owner.

Ottawa, Ont.

Millson, Burgess & Hazelgrove, are preparing plans for altering residence into apartment house on Cartier St. Lt. Col. E. R. McNeil, Queen St., is the owner.

Pointe du Lac, Que.

Zephir Pratte is the owner of $12,000 residence being built here. Masonry, electric, plumbing, heating and plastering to be let.

Sorel, Que.

P. J. A. Gardin Deputy, Roy St., is the owner and builder of $10,000 residence on Roy St. No material purchased except brick. Architect is J. P. Herouz, 105 George St.

The walls are going up for $25,000 apartment house on Roy St. J. S. B. Leclaire, Roy St., is owner and builder. Architect, J. P. Heroux, 105 George St. Roofing, electric, painting, plumbing, plastering, glazing and heating to be let.

St. Laurent, Que.

Foundations are going in for $8,000 residence on Monkland Blvd. J. O. Authier, 220 Principale St., is owner and builder. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing trades to be let.

Three Rivers, Que.

Adolphe Proulx, 314 Ste. Cecile, is owner and builder of $10,000 tenements on Ste. Cecile St. Electric, plumbing, heating and plastering to be let.

Toronto, Ont.

The footings are in for 2 residences, $5,000 each, east side Northcliffe Blvd., near Rogers Rd. Owner and builder is Brook Sykes, 7 Boon Ave., who employs regular staff. Painting, plastering, heating, electric and plumbing to be let.

The walls are going up for 2 residences, $8,000 each, north side Chaplin Cres., near Colin Ave. Glendale Investments, Ltd., are the owners and builders. Electric, painting, plumbing, plastering and heating trades still to be let.

Tenders are being received by the owner, Dr. A. Semple, 941 College St., in connection with $8,000 residence to be built on Humberside Rd. N. A. Armstrong Co., Ltd., are the architects.

Work is to start shortly for $12,000 duplex residence corner Indian Rd. and Algonquin Ave. Wm. J. Brown, 130 Indian Rd., is the owner. No material purchased.

John Cummings, 417 Beresford Ave., is owner and builder of $8,500 residence on High Park Ave., near north east corner Humberside Ave. Carpentry day labor. Masonry, plumbing, painting, plastering, heating, glazing and electric to be let. No material purchased. Owner buys.

Bailey Bros., 33 Norton Rd., are the owners and builders of 2 residences, $4,500 each, at 137-9 Nairn Ave. Electric, heating and plumbing to be let.

Geo. K. Finn, 30 Melville Ave., is owner and builder of duplex residence at 58½ Melville Ave.,and is receiving tenders on plastering, plumbing, electric, heating and painting. Carpentry and masonry day labor.

Footings are in for 2 residences, $4,500 each, at 33-35 Blackthorne Ave. Owner and builder is Arthur Lord, 92 Blackthorne Ave. Painting, electric, plastering, plumbing and heating to be let.

Glendale Investment Co., Ltd., are the owners and builders of 2 residences, $8,000 each, being built on north side Chaplin Crescent, near Colin Ave., and will let electric, painting, plastering, heating and plumbing trades. Carpentry and masonry by day labor.

Foundations are going in for 2 stores and apartments, $8,000 each, west side Yonge St., near Bedford Park Ave. Weismiller & McKenzie, 2003 Yonge St., are the owners and builders and employ regular staff and buy materials as required. Carpentry and masonry by day labor.

Foundations are going in for $8,000 residence south side Rochester Ave., near St. Ives Ave. Owner and builder is John W. Scott, 576 Church St. Electric, painting, plastering, heating and plumbing to be let by owner. Masonry by day labor.

Independent Builders Ltd., 2782 West Dundas St., are the owners of 2 residences, $4,000 each, being built north side Millwood Rd., near Horwood Rd. Carpentry and masonry day labor. Plastering, electric, painting, heating and plumbing to be let by owners.

Foundations are going in for 2 pair residences, $7,000 a pair, south west corner Manor Rd., near Cleveland Ave. Owner and builder is V. Fountain, 870 Broadview Ave. Masonry by day labor. Plastering, electric, painting, heating and plumbing to be let by owner.

French Bros., 32 Earl St., are the owners and builders of 3 residences, $12,000, north side Northcliffe Blvd., near Rogers Rd. Tenders are being received on electric, painting, plastering, heating and plumbing.

Foundations are going in for 4 pair residences, $6,000 a pair, east side Henning Ave., near Eglinton Ave. Geo. Nicholson, 6 High Park Gardens, is owner and builder. Painting, plastering, heating, electric and plumbing to be let by owner. Carpentry and masonry by day labor.

Loxall Tile Co., 518 Clinton St., are the owners of 1 pair residences, $4,500 each, east side Winnett Ave., near Vaughan Rd., and employ regular staff.

Wm. Archer, 46 Soudan Ave., is owner and builder of 8 residences, $12,-

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Niagara Falls, Ont.

Tunnel Excavation

Sealed tenders addressed to the undersigned and endorsed "Tenders for Tunnel Excavation," will be received until twelve o'clock noon,

Saturday, December 1st, 1923,

for the extension of the Scenic Tunnel at Table Rock, Niagara Falls, Ontario.

Plans may be seen and specifications with form of tender obtained at the office of the Queen Victoria Park Commissioners, Niagara Falls, Ont. Tenders must be accompanied by a marked cheque for at least 5% of the amount of tender.

The lowest or any tender not necessarily accepted.

(Sgd.) JOHN H. JACKSON, Supt.,
Queen Victoria Park.
Niagara Falls, Ont.

Niagara Falls, Ont.
November 17th, 1923. 47-48

Tenders for Concrete Arch Bridge

COUNTY OF PETERBORO

Sealed tenders will be received by Ed. M. Elliott, County Clerk up till 2 p.m.

Tuesday, January 22nd, 1924,

for the construction of a concrete arch bridge at Lakefield, Ontario.

The bridge consists of 2 open spandrel arch spans of 109′ and 84′ with 20′ roadway and one 6′ sidewalk, the total estimated quantity of concrete being 658.3 cu. yds.

Intending bidders are advised to see the site at once.

Plans and specifications may be seen at the Offices of the County Clerk at Peterboro, the Village Clerk at Lakefield and the Undersigned.

A marked cheque or bid-bond for 5% of the amount of the tender must accompany it as guarantee of good faith.

The lowest or any tender not necessarily accepted.

A. W. CONNOR & CO.,
County Engineers,
34 Victoria St., Toronto.

48-49

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same. Box No. 407, Contract Record, Toronto. 44 T.f.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Niagara Falls, Ont.

Tenders for Two Concrete Arch Bridges

Sealed proposals addressed to the undersigned and endorsed "Tender for Concrete Arch Bridges" will be received until twelve o'clock noon

Saturday, December 1st, 1923,

for the construction of two concrete arch bridges.

Plans and specifications may be seen and form of tender obtained at the offices of the Queen Victoria Park Commissioners at Niagara Falls, Ontario.

Each tender must be accompanied by an accepted cheque made payable to the order of the Queen Victoria Park Commission for at least 5% of the amount of the tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON,
Superintendent.
Queen Victoria Niagara Falls Park Commission,
Niagara Falls, Ontario.

47-48

TENDERS

Sealed tenders addressed to Dr. W. E. McNeill, Registrar, Queen's University, Kingston, Ont., will be received up to noon of

12th December, 1923,

for Interior Finished Woodwork, Ornamental Iron Work, required for

Library Building, Queen's University, Kingston, Ont.

Each tender must be accompanied by a marked cheque to the order of Treasurer, Queen's University, for 5% of the amount of the tender. Cheques of unsuccessful tenderers will be returned after contracts are awarded.

Performance Bonds shall be furnished at Owner's option and expense, by the successful tenderers.

The Owners reserve the right to reject any or all tenders.

Drawings and Specifications may be seen at Registrar's Office, Queen's University, Kingston, and at Builders' Exchange, Toronto; or they may be had upon deposit of $15.00 for their safe return by applying to the Architects.

SHEPARD and CALVIN,
36 Toronto Street,
TORONTO.

48

Toronto General Hospital

TENDERS

will be received by the undersigned till 12 o'clock noon,

December 15th,

for all the various trades required in the erection and completion of an extension to the Toronto General Hospital, Out Patients Department, University Avenue and College Street.

Plans and specifications may be seen and any other information obtained at the office of the Architects.

The lowest or any tender not necessarily accepted.

To receive consideration all tenders must be submitted on Form of Tender to be obtained from the Architect' office.

DARLING & PEARSON, Architects,
2 Leader Lane, TORONTO.

48

Wanted

Cyclone Well Drill to handle 4¼ inch stem, 20 feet long. Law Construction Company, Toronto. 47-48 Fv.

Machinery for Sale

1—reversible builders hoist.
1 6-H.P. Ideal gas engine.
1 double cage builders elevator 75 foot lift.
1 pole derrick.
1 No. 6 London Concrete mixer.
1 5-H.P. electric motor.

W. J. Hickey,
119 East Main St., Welland

47-48

Wider Use of Canadian Coal

Some valuable suggestions, in connection with the fuel situation in Canada, are contained in an interim report recently issued by the Dominion Fuel Board, which has been formed to study the underlying causes of coal shortages and methods by which they may be counteracted. The report of the Board, of which Charles Camsell is chairman, lays stress on the necessity of dispensing with the use of anthracite and the advisibility of using Canadian coal so as to be independent of the United States as far as possible. The report urges the more general use of Alberta coal and the establishment of coking plants in the Dominion in order to utilize, to the best advantage, the large deposits of bituminous coal in Canada and the United States.

Residences

(Continued from page 53)

000, south side Cranbrook Ave., near Elm Road. Heating and electric to be let. Carpentry, plastering and painting by day labor.

Excavation work is to start for 2 residences, $4,500 each, north side Mahoney Ave., near Weston Rd. R. Young, 396 Quebec Ave., is owner and builder. Plastering, heating, painting, electric and plumbing trades to be let.

T. Robinson, 11 Evelyn Crescent is the owner and builder of 2 residences, $9,000 each, east side May Ave., near Weatherall. Plastering, electric, painting, heating and plumbing to be let.

Foundations are going in for 2 residences, $6,000 each, east side Lauder Ave., near Rogers Rd. Law & Smith, 326 Lauder Ave., are the owners and builders. Plastering, electric, painting, heating and plumbing to be let.

Tenders are being received on plastering, painting, plumbing, electric and heating on $15,000 residence being built west side Dovercourt Rd., near Bloor. Owner is Dr. W. M. Robb, 740 Dovercourt Road.

Westmount, Que.

Foundations are in for 1 pair residences, $30,000, on Prince Albert Ave. J. Hand, 4857 Sherbrooke Ave., is owner and builder. Millwork, roofing, electric and tiling to be let.

Windsor, Ont.

Excavation work is being done for $8,500 duplex residence on Victoria Ave. Owner and general contractor is J. J. McCloskey 1701 Giles Blvd. Plastering, electric and plumbing to be let. No material purchased.

L. D. Galloway, 357 Windermere Rd., is the owner and general contractor of one $7,000 and one $7,500 duplex residence being built on Gladstone Ave. Plumbing, plastering and electric to be let. No material purchased.

G. Murray, 1018 Elsmere Ave., is owner and general contractor of $7,500 duplex residence being built on Elsmere Ave. Painting, plastering, heating, electric and plumbing to be let. No material purchased.

CONTRACTS AWARDED

Cooksville, Ont.

The following sub-trades have been let on 3 residences, $5,000 each, being built on Centre Rd. N.; electric, heating and plumbing—H. V. Moore, Cooksville; plastering—Mr. McGinty, Port Credit. A. H. Forster, 279 Indian Rd., Toronto, is the owner and builder.

Ford, Ont.

L. T. Beno, 85 Ellrose Ave., is the general contractor for $6,200 residence being built on Dawson Rd., for J. G. Lafortune, 103 Drouillard Rd. No material purchased.

Hamilton, Ont.

The walls are going up for $20,000 residence, corner Queen and Glenfern, for Robt. Mills, Queen St. S. Following sub-trades have been let; plastering—Hannaford Bros.; painting—O. H. Holcombe, 160 Markland St.; electric—W. R. Kinney, 74 Lorne Ave; plumbing and heating—Adam Clark, 7 Main St. W. General contractors are Mitchell & Riddell. Architects Hutton & Souter.

Montreal, Que.

The following sub-trades have been let on $18,000 cottage being built on Girouard Ave.; brickwork—Mr. Tranchemontagne; roofing—Jos. Lamarche; electric—O. Labelle; plumbing and heating—Belisle & Freres, Ltd.; plastering—J. O. Nantel; painting and glazing—R. Lefreniere; tiling—H. Capra. F. Deslauriers, 700 Girouard.

Following sub-trades have been let on $10,000 residence being built on Victoria Ave., for J. K. L. Ross, 107 St. James St.; millwork—Wm. Rutherford, 425 Atwater Ave.; electric—H. R. Cassidy, 255 Regent; plumbing and heating—Whyte & Ware; tiling—Brown & Son; plastering—K. C. Dibau; painting—John Croft. Masonry, carpentry and roofing by general contractors, L. A. Ott & Co., Ltd.

The following sub-trades have been let on 2 residences, $20,000, being built on Mire Ave. for J. K. L. Ross, 107 St. James St.; electric—H. R. Cassidy, 225 Regent St.; plumbing and heating—Whyte & Ware; plastering—K. C. Diau; painting and glazing—John Croft; tiling—Brown and Son; masonry, carpentry and roofing by general contractor, L. A. Ott & Co., 10 Cathcart Ct.

Vezina & Dugal, 849 Mary Ann E., have the general contract for $12,000 cottage being built on Delorimier, near Sherbrooke, for Jos. Lachapelle; 59 Kent. Brickwork, roofing, millwork, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Work is to start at once for $12,000 residence on Jeanne D'Arc, near C.N.R. tracks for T. Paquette, 451 Drolet St. General contractors are La Corporation Des Logements Ouvriers, Ltd. Carpentry, millwork, roofing, electric and plumbing to be let. Excavation and masonry by general contractors. Plastering and painting by day labor.

The following sub-trades have been let on $35,000 residence being built on St. Joseph Blvd., between Fabre and Garnier; brickwork—Theode Frenette, 615 Garnier; millwork—H. Chagnon & Cie; roofing—M. Chouinard, 751 Adam; electric—J. A. St. Amour, 2171 St. Denis; plumbing and heating—Jas. Francoeur & Cie; plastering—G. Rochefort, 273 Valois. Painting and glazing day labor, by owner and builder, U. Boileau, 568 Garnier. Marble, tiling and ornamental iron stairs and balconies to be let.

Following sub-trades have been let on $36,000 residence being built on Mire Ave., Notre Dame de Grace, for Sir Herbert Holt, 83 Craig St. W., and 3 residences, $30,000, being built on Glencairn Ave., for Est. D. Williamson: millwork—Wm. Rutherford & Sons; electric—H. R. Cassidy, 255 Regent St.; plumbing and heating—Whyte & Ware; tiling—Brown & Son; plastering—K. C. Dibau, care general contractor; painting and glazing—John Croft, care general contractor, L. A. Ott & Co., 10 Cathcart St. Masonry, carpentry and roofing by general contractor.

R. D. Clarke & Sons, Ltd., 26 Lincoln St., have the contract for plastering in connection with $12,000 repairs to residence at 715 Pine Ave. W. J. H. Birks, 715 Pine Ave. W. is the owner. Reid Bros., 2a Tower St., are the general contractors.

A. Staples, 125 Selby, has the contract for plumbing and heating for $15,000 residence on Queen Mary and Finchley Rd. for J. T. Stanger & Co. Mason, marble, millwork, roofing, sheet metal, electric, painting and glazing, tiling and ornamental iron to be let. Supervising builder is C. Thompson, care H. S. Taylor & Co., 285 Beaver Hall Hill, Montreal.

The following sub-trades have been let on $600,000 apartment house on Marlowe, between Sherbrooke and Northcliffe, for W. A. Handfield, 11 Place D'Armes; foundations, fireproofing, flooring and concrete work—Munn & Shea; brickwork and terra cotta—Duranceau & Duranceau. Other sub-trades to be let.

The following sub-trades have been let on 2 residences, $10,000, on 9th Ave., between Masson and St. Jerome; millwork—C. A. Cayouette & Fils; roofing—S. Martineau, 1666 St. Dominique; plastering—D. Pare, 1546 Papineau. Electric, plumbing, painting and glazing to be let. Excavation and masonry work by owner. W. Begnoche, 106 Rivard.

Foundations are going in for $18,000 residence on Jolicoeur, between Mazarin and Orchard. Owner and builder is S. Joly, 246 Mazarin. Brickwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let. C. A. Cayouette & Fils, 123 Jolicoeur, have the contract for millwork.

A. Masson, Notre Dame St., has the contract for masonry on $15,000 residence being built on Chateaubriand, between Belanger and St. Zotique. Roofing, electric, plumbing, plastering, painting and glazing to be let. E. P. Belair, 159 Dufresne, is the owner and builder.

Outremont, Que.

Foundations are going in for $60,000 apartment house on Joyce, corner Wiseman, for C. A. Fortin, 816 Durocher. B. Cara, 40 Dante St., has the contract for brickwork. J. A. Julien, 780 Lacombe, is the general contractor. Other sub-trades to be let.

Gilletz & Co., have the general contract for repairs to apartment house corner Hutchison and Berube Sts. All work to be done by general contractors.

S. Martineau, 1666 St. Dominique, has the contract for roofing of 2 flats and garage, 13,500, on Durocher, near Lajoie, for Estate P. Langlois, 859 Durocher. Masonry and carpentry by general contractor, John Brown, 83 Dorchester W. Marble and tiling, electric, plumbing, heating, plastering and painting to be let. Architect, A. Potvin, 26 St. James St.

J. R. Loyer & Cie, 2094 Chateaubriand, have the general contract for 2 cottages being built on Davaar, near Lajoie, for Felix Perreault, 613 De St. Valier. Subtrades to be let.

Ottawa, Ont.

The following sub-trades have been let on $14,000 apartment house on Butternut Ave.; electric—Marchand Electric Co.; heating and plumbing—A. Monnette; plastering—A. Norman; painting—C. Charron. J. Couillard, 92 Putnam Ave. is the owner and general contractor.

Geo. A. Eaman, 102 First Ave. has the general contract for $9,000 double residence on Fairbairn Ave. for Mrs. Dr.

Eaman, Monkland Ave. 4,000 bricks and material for 36 cu. yds. concrete and 2,000 sq yds. plaster required. No material purchased.

J. B. Daust, Carleton, Ont., has the general contract for altering shop to apartments, $11,000, on Arlington Ave. 6,500 bricks and material for 27 cu. yds. concrete and 25,000 sq. yds. plaster required.

The walls are going up for $12,000 residence on Carling Ave., for Margaret A. Holloway, care general contractor, C. N. Hollister, 514 Bay St. Following sub-trades have been let; electric—Wallace Chugg, Bank and Second Ave.; plumbing and heating — McKinley & Northwood; plastering—Davis & Daly; painting — G. Green, Bank and Fourth Ave.

Quebec, Que.

T. E. Rousseau, 12 Fifth St., Limoilou, has the general contract for $9,000 residence to be built on Des Braves St., for J. D. Sutherland, 95 Claire Fontaine St

Sarnia, Ont.

D. W. Griffin, Durand St., is the general contractor for $9,000 residence on London Rd. for Chas H. Hanson, 257 S. Christina St. Masonry—Thos. Grace; millwork—Laidlaw Belton Lumber Co.,

S. Vancouver, B. C.

Stewart & Coltart have the general contract for $15,000 residence on River Rd., for Mrs. E. S. McLennan, 1995—19th Ave. W., South Vancouver. Townely & Matheson, 325 Homer St., Vancouver, are the architects.

Three Rivers, Que.

Jos. Lacroix, 10a St. Oliver St., is the general contractor for $10,000 semi-detached residence on St. Louis St., for Quebec & Ontario Bond & Mortgage Co. Masonry, electric, plumbing and plastering to be let.

Toronto, Ont.

The following sub-trades have been let on $15,000 residence being built on Russell Hill Rd., near Frybrook Rd.; electric—E. Addy, 128 Victor Ave.; plumbing and heating—A. E. Prouse, 38 Duggan Ave.; painting—T. Lane & Co., 109 Bloor West. Tiling and plastering to be let. A. R. Burk & Co., 18 Toronto St., are the architects.

The following sub-trades have been let on $8,500 residence and garage at 561 Durie St.; electric—J. Ritchie, 718 Annette; plumbing and heating — T. B. Smyth, 122 Avenue Rd.; plastering — J. Chapple, care owner and builder, R. C. Sutherland, 717 Annette St.

E. Waite, 745 Euclide Ave., has the general contract for $20,000 duplex residence on east side Bryce St. and will let plastering, plumbing, electric, heating and painting trades. No material purchased. General contractor buys.

I. Hopkins, 19 Westbrook Ave., has the contract for masonry on 2 residences, $4,000, on Meagher Ave., near Orley Ave. C. May, 498 Main St., is owner and builder and will let painting, heating, plumbing, plastering and electric trades. Carpentry, owner, day labor.

The walls are going up for $10,000 residence and garage west side Palisades Ave., near Ellis Ave., for A. B. Chapman, 1162 Queen West. I. J. Kent, 56 Kennedy Ave., is the general contractor.

The following sub-trades have been let on 4 pair residences, $7,000 each, being built west side Coxwell, below Danforth Ave.; electric—T. B. Kilner, 601 Jones Ave.; plumbing—W. J. Merrill, 862 Kingston Rd.; heating—Toronto Furnace Co. Painting day labor by owner, F. C. Lankin, 223 Fulton Ave.

Chas. Hough, 43 Playter Blvd., is the general contractor for $8,000 residence being built at 24 Glencairn Ave.

The following sub-trades have been let on 1 pair residences, $8,000, at 89-91 Woodington Ave.; electric — Taylor Bros.; plumbing — Hill & Whalaker; heating—Howard Furnace Co.; painting —A. M. Simmons, 612 Jones Ave. Plastering to be let. Jno. McMaster, 244 Chisholm Ave., is the owner and builder.

W. W. Petley & Co., have the general contract for $30,000 residence to be built on Highland Ave., for Mr. Wilkes, care architects, Waters & Wilkes, 43 Scott St.

Jas. A. Shier, 17 Graham Road, has the contract for masonry work on $15,000 duplex residence, south side Grimthorpe Ave., near Atlas Ave. J. A. Griffin, 48 Vimy Ridge Ave., is owner and builder. Plastering, electric, painting, heating and plumbing to be let.

Tenders are being received by general contractors, Graham & Sibbett, 9a Wellington East, for tiling for bathrooms of $18,000 residence and garage, north side Austin Terrace and Lyndhurst Ave. Electrical work is being done by Geo. Campbell, care general contractors. Owner is A. E. McLean, 386 Bay St.

T. Robinson, 11 Evelyn Crescent, is the builder of 2 residences, $15,000, east side May Ave., near Weatherall, for A. Robinson, Weston P.O. Plastering, electric, painting, heating and plumbing to be let by builder.

The following sub-trades have been let on $50,000 residence being built on

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During the winter season many of our contractors buy short dated bonds to keep their funds employed.

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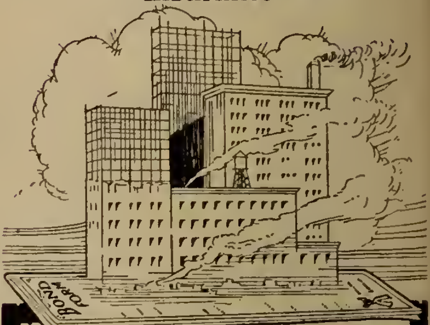

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MacLean Reports
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MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

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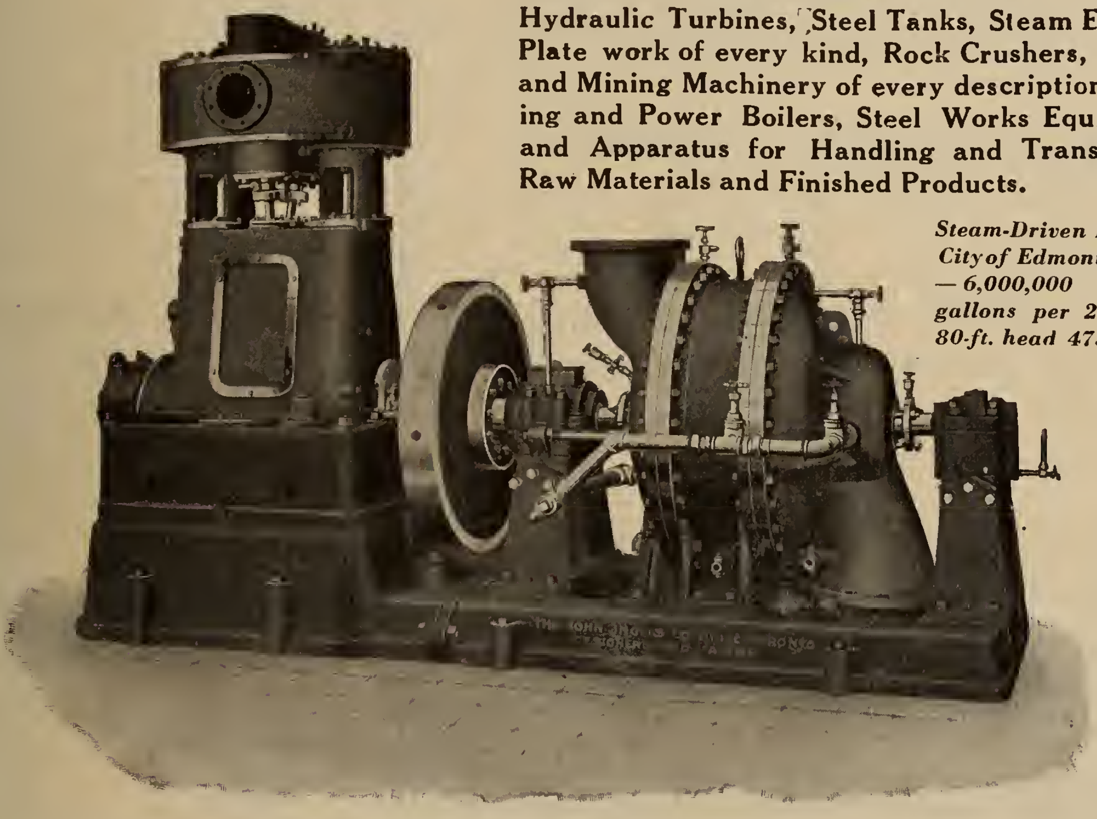

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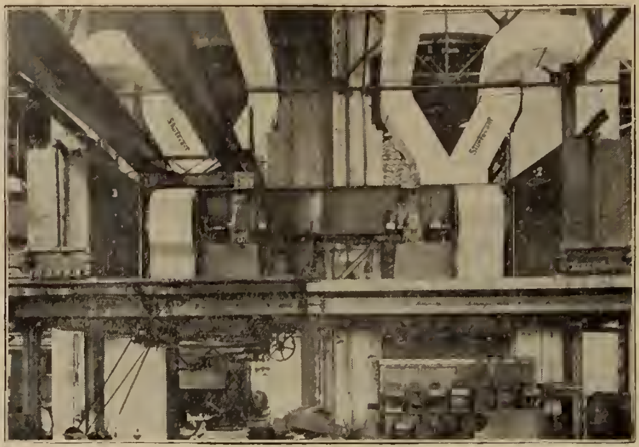

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Folder 606 contains a review of the modern trend in Heating and Ventilating engineering and Sturtevant's contributions thereto.

Complimentary copy on request.

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of Canada, Ltd.
Montreal Winnipeg Galt Toronto

Sturtevant
PUTS AIR TO WORK

Forest Hill Rd., for Clarence A. Bogart, care architect, J. M. Lyle, 230 Bloor W.; painting—Linnington Connell Co., Ltd.; plumbing and heating—McNaughton & McKenzie; plastering — Robertson & Findlay. Tiling to be let.

C. Strauss, 157 Bellwoods Ave., has the contract for plastering and R. McFadden, care owner, 766 Dundas W., has the contract for painting in connection with 5 residences, $12,000 each, being built west side Spadina Ave., near Austin Terrace.

Windsor, Ont.

E. P. Fox, 29 Indian Rd., Sandwich, Ont., is the general contractor for $8,500 duplex residence being built on Ouellette Ave., for Wm. Lanspeary. No material purchased.

J. & J. Ward, Dougal Ave., have the general contract for $8,500 duplex residence being built on Parent Ave., for J. A. Thibodeau, 820 Parent Ave. No material purchased.

Walkerville, Ont.

Contract for plumbing and heating $30,000 residence and garage being built for C. S. King, has been awarded to White Plumbing & Heating Co., at $5,640. Architects, Nichols & Sheppard, Windsor. E. G. Morley, 1340 Dougall Ave., Windsor, is the general contractor.

E. G. Morley, Dougall Ave., Windsor, Ont., has the general contract for $35,000 residence and garage being built for C. S. King, Chatham St. West, Windsor. Nichols & Sheppard, Windsor, are the architects.

Power Plants, Electricity and Telephones

Chelsea Falls, Que.

Riordon Co., Ltd., 355 Beaver Hall Hill, Montreal, contemplate building a power house on Gatineau River. Engineers in charge of work are Montreal Engineering Co., Ltd., 164 St. James St., Montreal. Contract for this work will be awarded shortly.

Mildmay, Ont.

Mildmay Electric Co. contemplates improving electric lighting system and is interested in prices of transformers.

St. Michael Des Saints, Que.

Toupin & Roi, 502 St. Catherine E., Montreal, contemplate an electric lighting system here.

St. Paulin, Que.

Algonquin Power Co., Montreal, Que., contemplate water power development on River Du Loup en Haut, estimated to cost $100 000. J. M. Robertson Ltd., 20 St. Nicholas St., Montreal, are the engineers.

Tidewater, N. S.

The Nova Scotia Power Commission has recently signed a contract with the Albany Perforated Wrapping Co., of Albany, N. Y., to furnish that company at West River, Sheet Harbor, with 4600 h.p. of electric energy. For the purpose of furnishing this power the commission will erect a second generating station on East River, Sheet Harbor. This station will operate at a head of about 100′ and will have an ultimate capacity of about 9000 h.p.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

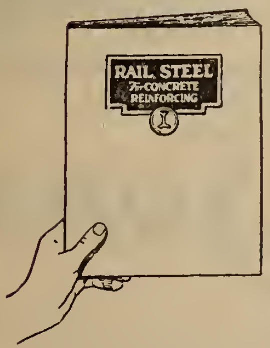
Specifications

A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff) made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steel."

Specification A-16-14 is, therefore, everything that a specification should be. It is a protection to the purchaser. It asures him of getting Rail Steel Bars, proven by over 3,000 tests to have a quality factor (strength and ductility) in excess of usual grades of steel. This specification at the same time prevents any substitution of undesirable re-rolled

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal



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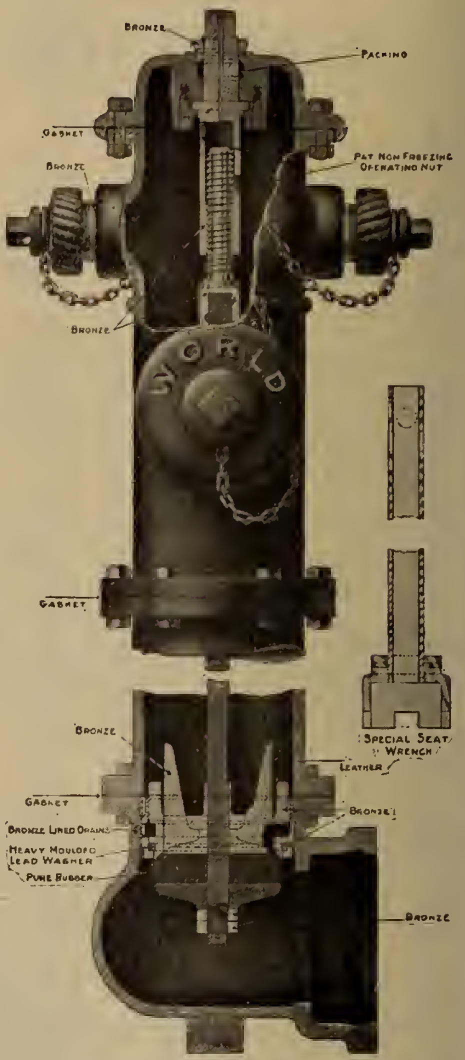

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The following Books are Offered subject to Previous Sale.

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"Estimating Building Costs," by Charles F. Dingman, first edition, published by McGraw-Hill Book Company, Incorporated. 240 pages. Price $2.50.

"Hand Book of Hydraulics," by Horace Williams King. 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $2.50.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $1.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Reinforced Concrete Construction", Volume 1, by George A. Hool, S. B. Second edition, published in 1917, 254 pages, illustrated. Price $2.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $1.00.

"Sheet-Metal Pattern Drafting and Shop Problems." by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $1.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $1.50.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.00.

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated. Price $3.50.

"Collected Papers On Acoustics," by Wallace Clement Sabine just published by the Harvard University Press. Price $3.50. 280 pages, illustrated.

"Practical Accounting for General Contractors"—by H. D. Grant. Published in 1922 by McGraw-Hill Book Company Incorporated, 254 pages. Price $3.00.

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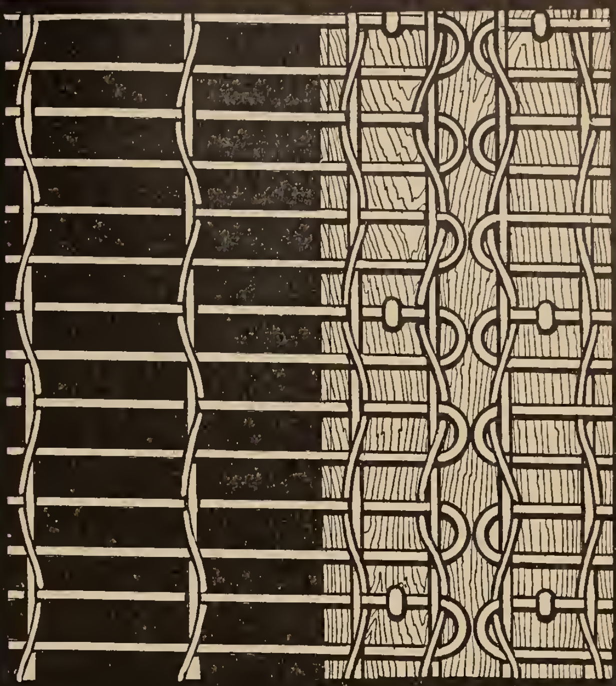

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CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20

LIME		Toronto	Montreal	Winnipeg	Vancouver
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		

BRICK and TILE (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	68-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00

STONE, SAND and GRAVEL (f.o.b. cars on siding):—		Toronto	Montreal	Winnipeg	Vancouver
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "

STEEL and IRON (f.o.b. warehouse):—		Toronto	Montreal	Winnipeg	Vancouver
Mild steel bars, ¼ in. and heavier	per 100 lbs	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.45 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.50 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		

VITRIFIED CLAY PRODUCTS (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50—6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
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DEPARTMENT OF LABOUR
BOILER INSPECTION NOTICE
Excerpt from Regulations for the Construction and Inspection of Boilers
Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

HON. Dr. FORBES GODFREY,
Minister of Labour.
D. M. MEDCALF, Chief Inspector of Steam Boilers.

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.23	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.20	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.55	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.

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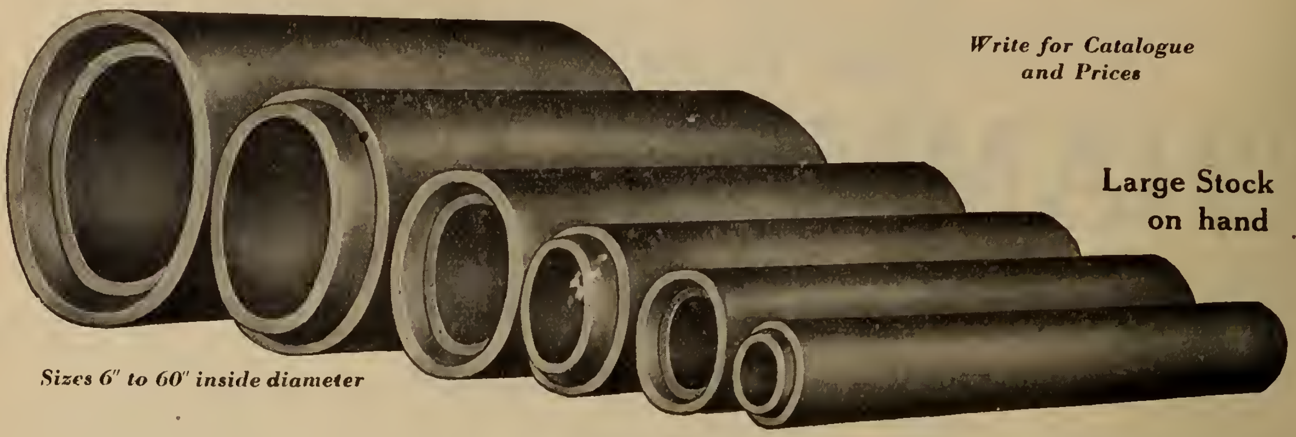

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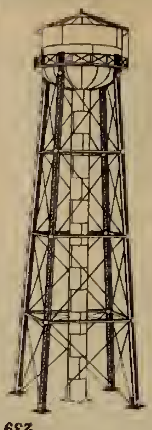

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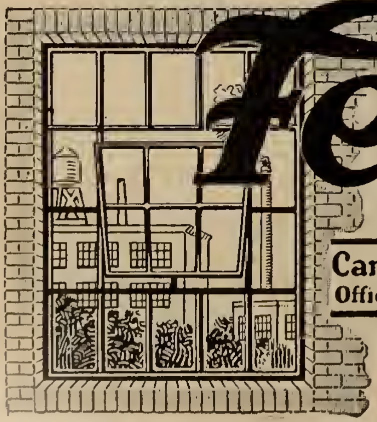

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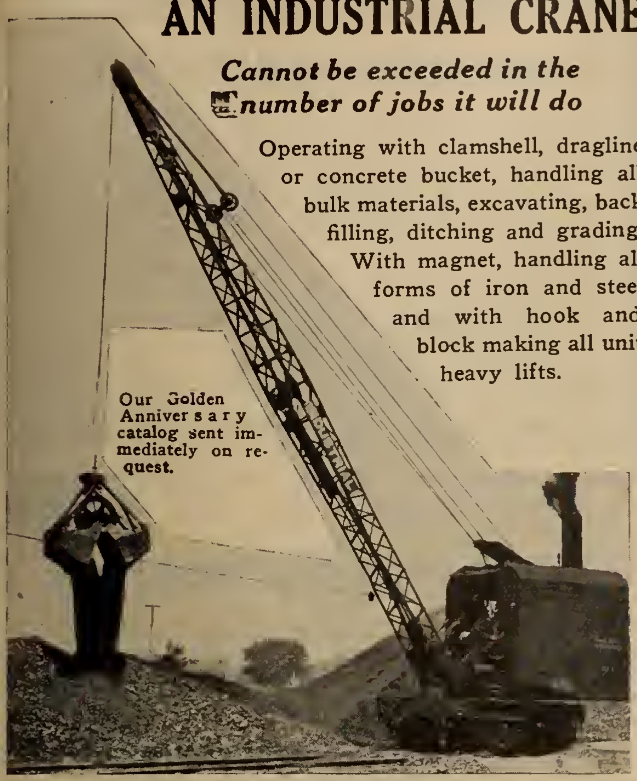

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Item 4025	8	"Can-Ingersoll Rand" Compressors—1053 cubic feet capacity—cross compound—belt driven.
Item 4026	5	"Sullivan" Compressors—1100 cubic feet capacity—angle compound—belt driven.

BOILERS

Item 3000	2	Locomotive Type Boilers—60 H.P. on skids.

CHANNELLERS

Item 4024	14	"Sullivan" Type VW-61 Channellers—Duplex.

CONCRETE MIXERS

Item 3004	15	"Ransome" Mixers—1 cubic yard capacity, electric driven—on skids.
Item 3005	3	"London" Mixers—1 cubic yard capacity, electric driven on skids.

CONVEYORS

Item 9006	1	"Stephens - Adamson" Conveyor 702′ centres—30 inch.
Item 9007	2	"Robins" Conveyors—600′ centres—24 inch.

DRILLS

Item 4016	20	"Can-Ingersoll Rand" Submarine Drills—Type H66
Item 4017	40	"Sullivan" Tripod Drills—Type FP-3.
Item 4021	5	"Canadian Ingersoll Rand" Tripod Drills—Type LG54.
Item 4022	8	"Canadian Ingersoll Rand Tripod Drills—Type LG53¼.
Item 4018	50	"Sullivan" Hammer Drills—Type DP33.
Item 4019	10	"Canadian Ingersoll Rand" Jackhamers BCR-430.
Item 4020	15	"Canadian Ingersoll Rand" Jackhamers DDR-13.
Item 4023	12	"Oldham" Plug Drills—Type L.

HOISTS

Item 9196	2	"Mead Morrison" Electric Hoists—Double Drum—with 80 H.P. Motors.
Item 3007	6	"Marsh Engineering Works" Electric Hoists—Double Drum—with 75 H.P. Motors.
Item 9197	1	"Maine" Electric Hoist—Double Drums—with 37 H.P. Motor.

LOCOMOTIVES

Item 4005	1	"American" Saddle Tank—18 x 24 cyls.—57 Tons.
Item 4003	2	"Montreal Loco. Works" Saddle Tank—10″ x 14″ cylinders—18 Tons—standard gauge.
Item 4002	2	"Pennsylvania" Switchers—17″ x 24″ cyls.—40 Tons—with 8 wheel Tenders.
Item 3009	5	Electric Locomotives 500/600 volt D. C.—50 Tons.

SHOVELS

Item 4001	1	Model 60 "Marion"—2½ yd.—70 Tons.
Item 4000	1	Class C-45 Atlantic—2½ yd.—65 Tons.
Item 3011	2	Model 103C "Bucyrus" Electric—4½ yd.
Item 3012	3	Model 225B "Bucyrus" Electric 6-8 yd.

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Item 3013	1	"Can. Car & Fdry. Co." Standard R.R. Snow Plow.

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Item 3015	4	"Fordson" Gasoline Tractors complete.

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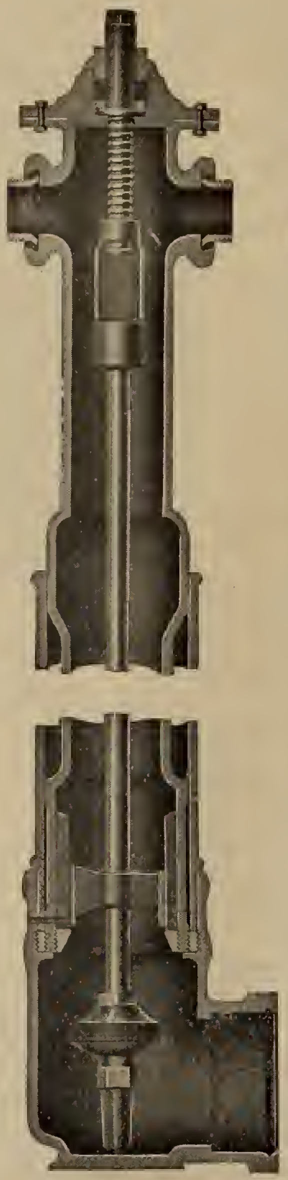

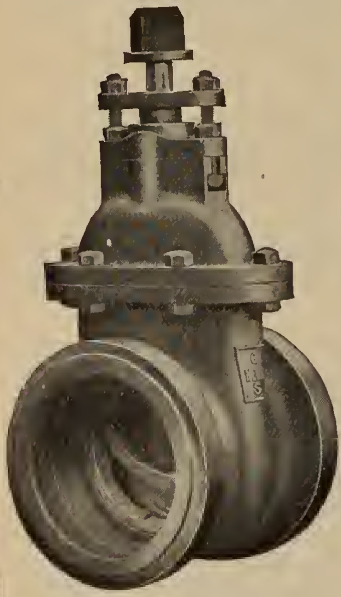

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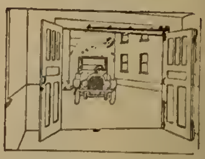

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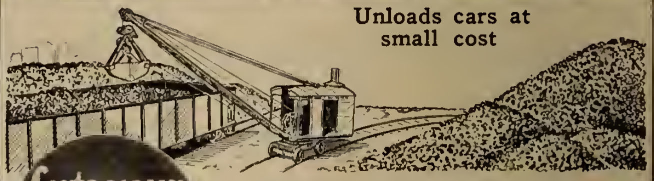

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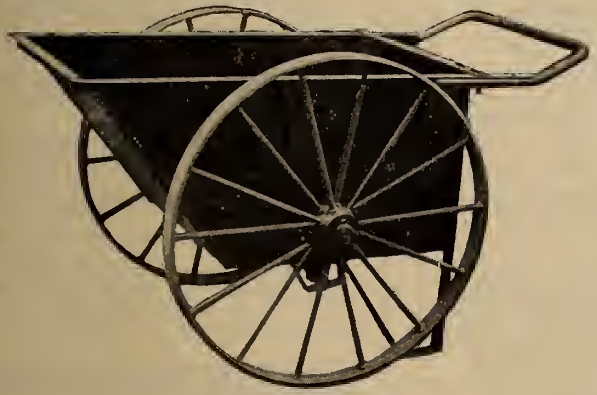

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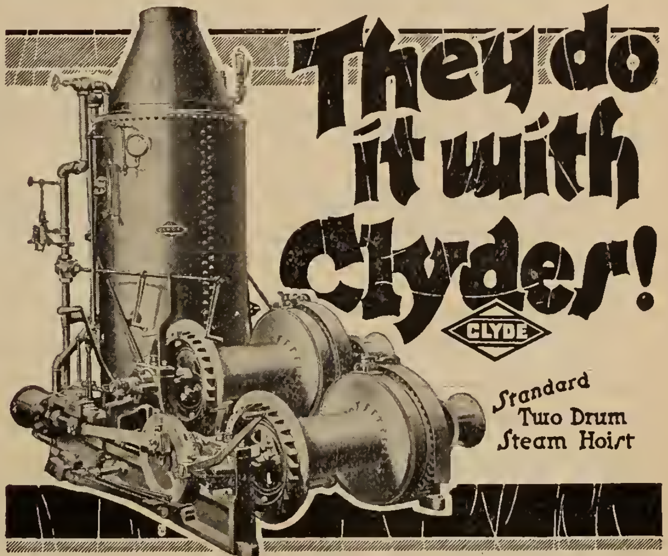

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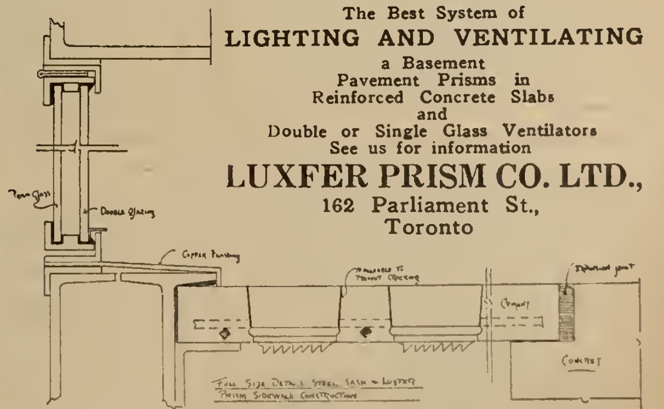
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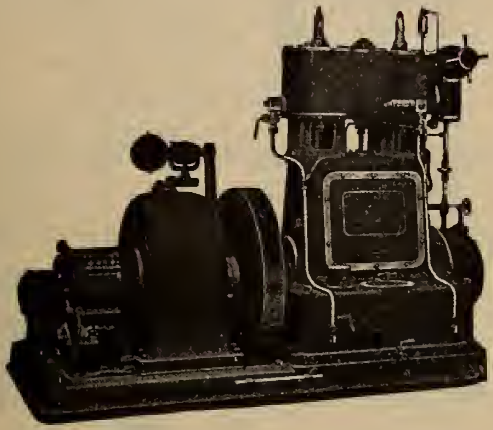

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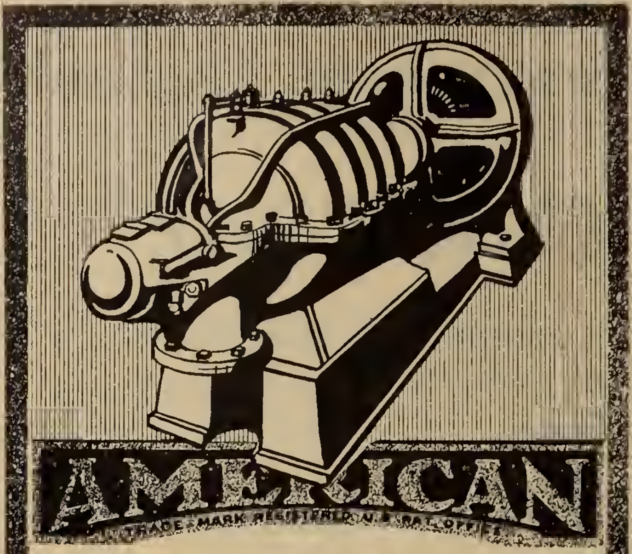
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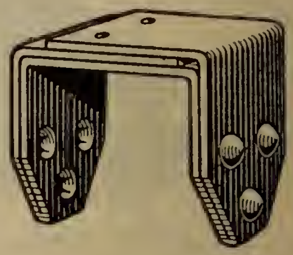

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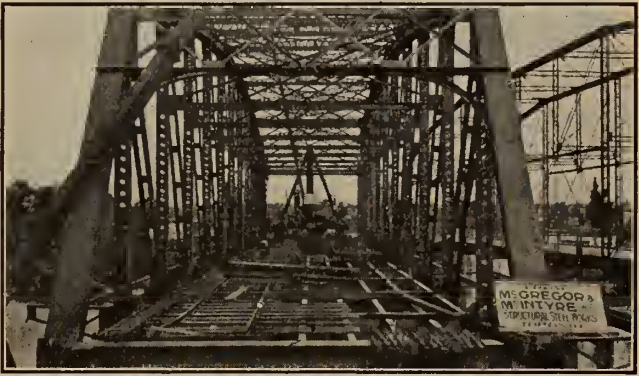

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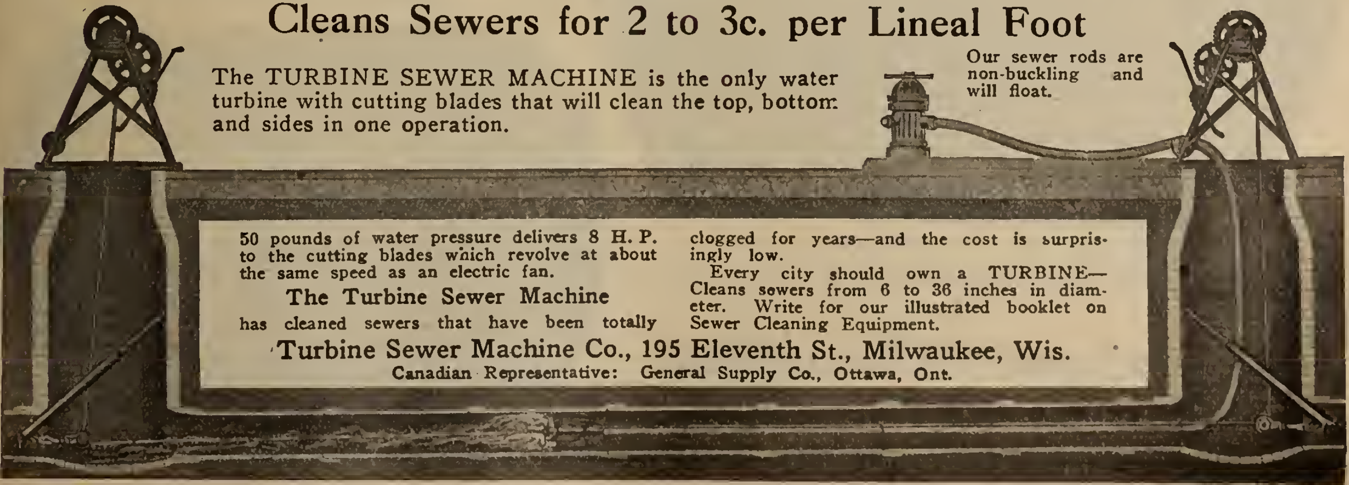

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ANYTIME—anywhere—no matter what size your order, Muldoon is ready to offer you the same prompt, careful service used by dozens of other contractors throughout Toronto and vicinity.

Try Muldoon on the following—Lath, Grey and Hydrated Lime, Plaster, Cement, Sewer Pipe, Crushed Stone, Etc.

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TORONTO

J. MULDOON, LIMITED
Lath
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Coal
SERVICE

Branch
Bloor and Perth Avenue
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TORONTO

BATES SYSTEM

OF BAR TYING
for
Reinforced Concrete Work

Save 2/3rds the time on concrete reinforcing jobs by using Bates Bar Ties and Tying Tools.

Three turns of the Bates Tool and the Bars are tied.

Write for circular covering prices, etc.

BATES SYSTEM FOR FILLING & CLOSING BAGS

Tying Concrete Reinforcing Bars with Bates bar ties and tying tool

Bates Bar ties were used on the largest reinforced concrete jobs in the United States and Canada.

A large stock of bar ties all sizes carried in stock for immediate shipment.

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BATES VALVE BAG CO., LIMITED

Niagara Falls, Ont., Canada

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DRUMMOND & REEVES LTD.
Toronto, Ontario

MUSSENS LIMITED
Montreal, Winnipeg, Vancouver

CAST IRON PIPE

STANDARD CAST IRON PIPE
also
DeLAVAUD Centrifugal Process

All sizes in Stock
for

WATER **CULVERT**
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Made in Canada
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Electric Wiring
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Labelled under supervision of Underwriters Laboratories
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Manufactured by
National Conduit Co., Limited
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Structural Steel for Bridges and Buildings
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Limited
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Assure yourself materials purchased are to specifications, also prevent delay in deliveries by marking your orders subject to, "HUNT INSPECTION."

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CANADIAN TANKS DES MOINES TRADE MARK

We design, fabricate and erect stacks, tanks and riveted pipe of every description. The efficient service of DES MOINES erection crews is only a small part of the DES MOINES whole.

Canadian Des Moines Steel Co., Ltd.

267 Inches Ave., Chatham, Ont *64 St. James Street, Montreal, Que.*

CANADIAN DES MOINES

We specialize in

Docks	**Foundations**
Canals	**Breakwaters**
Harbours	**Industrial Plants**

Above illustration shows travelling derrick handling 18-ton concrete blocks for Western Breakwater, Toronto Harbor Improvement Contract

Roger Miller & Sons, Ltd.
Engineers and Contractors
Head Office: Lumsden Bldg., Toronto

The Economical Handling of Materials is an Important Factor in Meeting Present Keen Competition.

O. S. Dependable Locomotive Cranes produce these results.

Write for catalog No. 18.

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James A. Thomson, Vice-President

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MANUFACTURERS OF

Flexible and Flange Pipe and Special Castings

Flanged Ts., Bends, etc., made to any specification.

3 inches to 60 inches diameter,

for Water, Gas, and Culvert

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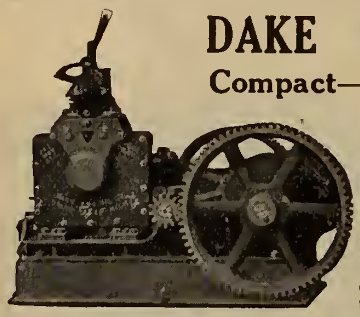

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Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.

Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.

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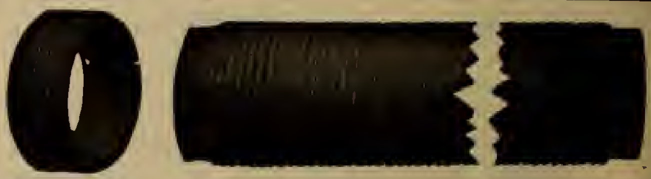

Pacific Coast Pipe Co., Ltd.

Wire Wound Wood Stave Pipe

from 2 in. to 24 in. diameter

Continuous Stave Pipe

from 16 in. to 12 ft. diameter

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"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited

Sole Manufacturers under Canadian and U. S. Letters Patent

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INTERNATIONAL ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines

Company, Limited

300 Campbell Avenue, Toronto

CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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A Hint to the Wise

CONTRACTORS, architects and building owners are everywhere specifying Turnbull Passenger and Freight Elevators. Apparently, the day has gone when "something just as good" would do, the idea now being that to get Turnbull Super-Service you must have Turnbull Elevators.

Our engineers are at your service.

The TURNBULL ELEVATOR CO.
Limited, Toronto
Montreal Branch: 10 Victoria St.
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Windsor, Halifax, St. John

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Why Take Chances With Wire Rope?

Our BLUE STRAND

Offers protection against getting the wrong grade of rope for

CRANES, SHOVELS, HOISTS &c

Blocks — Clips — Thimbles — Turnbuckles, Etc.

THE DOMINION WIRE ROPE CO. Limited

Head Office: MONTREAL
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The many repeat orders from former customers speak louder than words of the reliability of

"NOVO" ENGINES

Gas, Gasoline and Kerosene

AIR COMPRESSOR OUTFITS
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Immediate Shipment from Montreal

Thorough reliability under all conditions of service has made NOVO Power synonymous with reliable power.

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F·H·Hopkins & Co. Limited

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MONTREAL
Telephone Main 3420

Vol. 37 Toronto, December 5, 1923 No. 49

Contract Record and Engineering Review

There is a Reason

justifying the transportation of lumber across the continent for constructing wood stave penstock.

It is based on low annual charges due to long life and excellence of material.

B. C. (Douglas) Fir Pipe, installed on Atlantic Coast

Wire Wound
Wood Pipe

Steam Pipe Casing

Tanks for all purposes

Conduit

120" Diam. Wood Pipe, Nova Scotia

Pacific Coast Pipe Co., Limited
1551 Granville Street - - Vancouver, B.C.

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Announcement

BABCOCK & WILCOX, LIMITED,
of LONDON, ENG.,
The GOLDIE & McCULLOCH CO.,
LIMITED, of GALT, ONT.
and
THE BABCOCK & WILCOX CO.,
of NEW YORK
wish to announce the formation of a new Company known as

BABCOCK-WILCOX & GOLDIE-McCULLOCH, LIMITED

for the manufacture of Steam Power Plant Equipment and Accessories, with Head Office and Works at Galt, Ont. The constituent Companies desire to extend to their clients grateful thanks and appreciation of the confidence extended to them in the past and express the hope that the new Company will continue to deserve and receive it in the future.

THE GOLDIE & McCULLOCH COMPANY, LIMITED

will continue in business as manufacturers of Safes, Vault Doors, Vault Linings, Safety Deposit Boxes, etc., with Head Office and Works at Galt, Ontario.

Galt, Ontario
November, 1923

Concrete Blocks, Brick and Culvert and Sewer Tile

are staple articles. Thousands of contractors who operate their own plants have found this the most profitable branch of their business. It provides work for their men during winter months and will provide a source of income the year around.

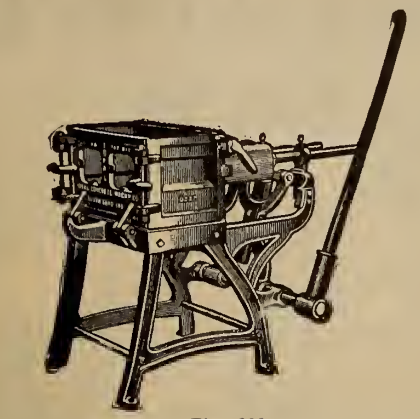


Fig. 910

IDEAL CONCRETE BLOCK MACHINES THE WORLD'S STANDARD

The Ideal Concrete Block Machines stand supreme the world over, and the Ideal Concrete Blocks are accepted as the standard for Concrete Block Construction by Engineers everywhere.

The Ideal Block Machine makes every style of block required.

—Fully described in Catalogue No. 22-B-1

The Ideal Concrete Block stands supreme the world over. They are made in any size, shape or design to suit the most exacting Architect or Engineer. One of the most recent developments is that of making blocks to receive stucco finish, which is very popular in house construction.

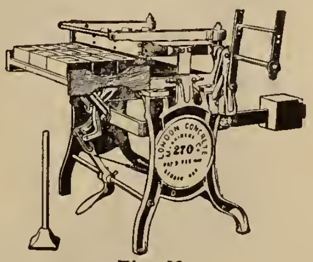


Fig. 91

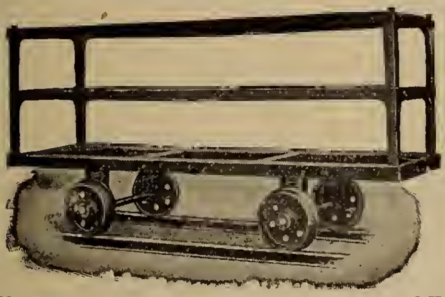
LONDON CEMENT BRICK MACHINE

Hand Power

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression. This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.

Cement Brick are in good demand in many localities where building materials are required. They are suitable for all classes of construction and can be profitably made without a large expenditure.



We Make a Full Line of Brick, Block and Tile Cars. Prices on Application

—Fully described in Bulletin No. 17

London Tile and Sewer Pipe Moulds have been used to make concrete tile for every large Municipal Sewer contract in Canada within recent years. They make tile in all sizes from 4 inches up to 10 feet in diameter.

LONDON CULVERT TILE AND SEWER-PIPE MOULDS

Made in all Sizes From 4 in. to 72 in.

Our moulds are made on designs approved by Engineers. There are large profits in making Culvert Tile and Sewer Pipe.

—Described in Bulletin P-1.

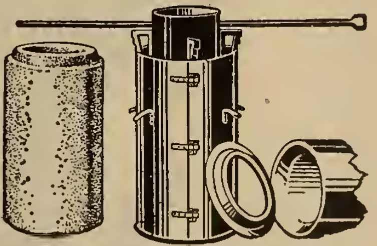


Fig. 95.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7, London, Canada

World's Largest Manufacturers of Concrete Machinery

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McCRACKEN SEWER PIPE
Is Winning Canada's Favor

H·W·Patterson
Engineer
Walkerville & Ford
Says—

"Walkerville, Ontario, March 5th, 1923.

Mr. W. I. Newmarch,
John E. Russell Co. Ltd.,
Harbor Administration Bldg., Toronto, Ont.
Dear Sir:

We laid three miles of McCracken Pipe twenty-four inches to six inches in 1920. Combined sewers are in excellent condition. We are using one line as outlet for centrifugal line pump, three-inch discharge. We consider McCracken Pipe satisfactory for combined sewers, and will be calling upon you shortly for four miles additional pipe.

H. W. PATTERSON,
Engineer, Walkerville and Ford."

McCRACKEN Concrete Sewer Pipe has proved its case in Canada. Experienced engineers in all parts of the Dominion are giving it their hearty endorsement.

This widespread popularity is partly because McCracken Concrete Sewer Pipe is manufactured in accordance with standard specifications issued by the American Society for Testing Materials, and inspected by the Canadian Inspection and Testing Company Limited. And of equal importance—engineers recognize the great advantage of the uniform high quality of this pipe. They know that they can depend on every foot they buy.

McCRACKEN
SEWER PIPE
"The Pipe That Endures"

JNO. E. RUSSELL CO., LIMITED
GENERAL SALES AGENTS
Harbor Administration Building, Toronto

Two ERIES owned by C. S. Luck & Sons, Richmond, Va.

"Every man in business has to go over a hard road and find out its turnings for himself. But he need not go over his road in the dark if he can take with him the light of other men's experience."— *John Wanamaker*

Your own way can be seen clearly, by "the light of other men's expERIEnce"

The man who has steam shovel or crane work does not need to stumble in the dark. Others have lighted the way for him.

Contractors who have compared different makes of steam shovels report that their ERIES cost only ⅓ as much to keep up— WITH A CORRESPONDING SAVING IN WORKING TIME.

You will find conclusive proof of this in our new 72-page book: "Upkeep Costs and Output Records of ERIE Shovels." Actual records of 48 ERIES on various kinds of work— write for Bulletin S-70.

HUNDREDS of contractors have written letters like this: "The ERIE is far superior in every way— there is no other shovel that can equal it for reliable service and low upkeep cost."— *R. C. Myers, Strange-Maguire Co., Salt Lake City, Utah. (They have 2 ERIES.)*

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.
Incorporated 1883 : formerly BALL ENGINE CO.
Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

ERIE Steam Shovel Co.

Branch Offices:
Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago
Representatives throughout the U. S. A.

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  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dump Bodies
  - Dominion Truck Equipment Co
  - Wood Hydraulic Hoist & Body Co.
- Dump Cars, Wheels, etc.
  - Canadian Equipment Co.
  - Dominion Bridge Co., Ltd.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

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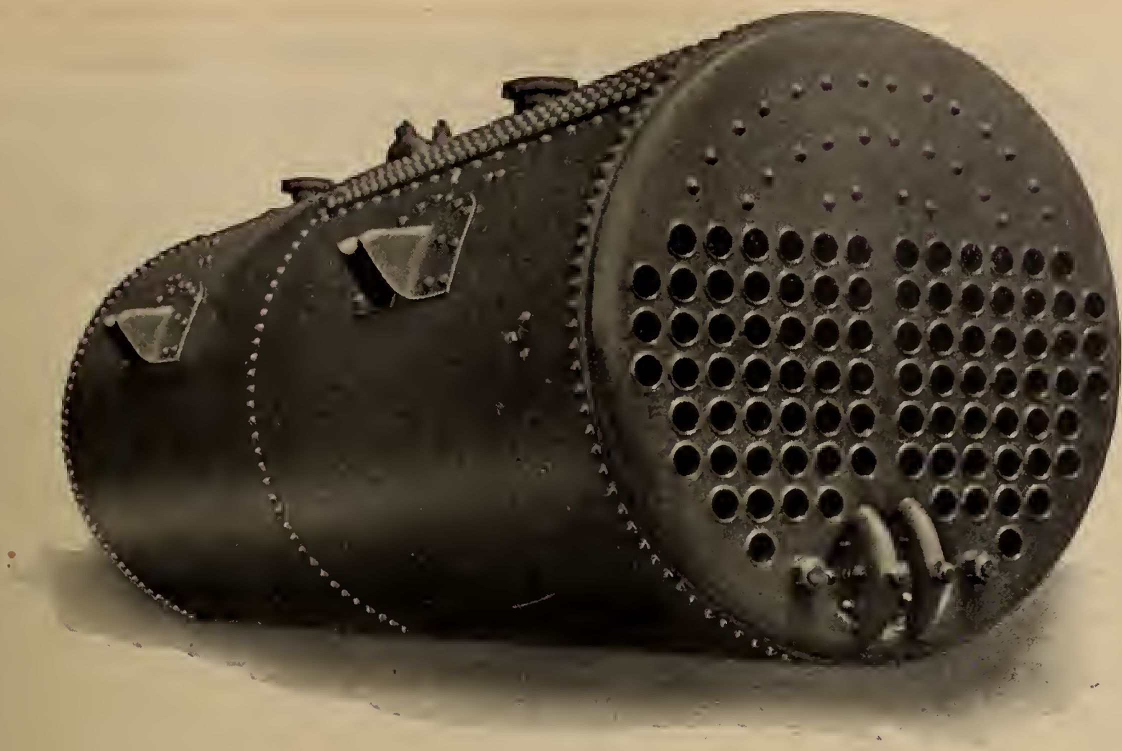

When you need a new Boiler let this plant show you what it can do

With our 35 years' experience, we are able to turn out Boilers of latest design, of all types, at low first cost, of high efficiency and long service records with minimum stoppages for repairs.

The construction is carried out with scrupulous care at every step. All rivet holes are accurately laid out—no drift pins being used. Caulking edges are neatly bevelled and all seams thoroughly caulked. Tube holes in heads are accurately machine-cut and edges carefully chamfered. All tubes are expanded and beaded over at both ends. On completion, all boilers are tested to at least one and a half times their working pressure before leaving our works. We equip our Boilers or sell as a separate unit the popular National Hand Fired Stoker which gives you the efficiency of the large mechanical Stokers at a fraction of the cost.

We build to suit the Interprovincial Boiler Code and we can ship economically by rail or water. Let us show you what we can do for you.

We build Horizontal Return Tubular, Vertical Tubular, Locomotive Type and Marine Boilers. We construct Tanks, Penstocks and Steel Plate work of all kinds. We furnish gray iron and brass castings of any size in the rough or machined to order.

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices: Hall Machinery Co., Sherbrooke, Que., and Birks Bldg., Montreal
Winnipeg Agents: Powell Equipment Company, Limited. Vancouver Agents: M. Grindley Co.

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- **Electric Fans**
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  - Sturtevant, B. F. & Co.
- **Electrical Specialties**
  - Spielman Agencies Regd.
- **Electrical Contractors**
  - Canada Electric Co.
- **Elevator Doors**
  - Ormsby Company, A. B.
- **Elevators**
  - Link-Belt Limited
  - Jeffrey Manufacturing Co.
  - Otis-Fensom Elevator Co.
  - Turnbull Elevator Company
- **Enameled Brick**
  - American Enameled Brick & Tile Company
- **Engines**
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll Rand Co.
  - Clyde Iron Works
  - Fuller & Johnson Mfg. Co.
  - Hopkins & Co., Ltd., F. H.
  - Inglis Co., John
  - Laurie & Lamb
  - Le Roi Company
  - Lorne Tractors
  - Sterling Engine Co.
  - Waterous Engine Works Co.
- **Engines—Swinging**
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  - Clyde Iron Works Sales Co.
- **Engineers (Civil and Mechanical)**
  - Chipman & Power
  - Hunt & Co., Robt. W.
  - Milton Hersey Company
  - Lea, R. S. & W. S.
- **Excavators**
  - Ball Engine Co.
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
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  - **Engineering & Machine Works of Canada Ltd.**
  - Erie Steam Shovel Co.
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - Lumsden Engineering & Contracting Co.
  - Mussens Limited
  - Thew Shovel Co.
- **Exhausters**
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- **Exhaust Heads**
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- **Fans**
  - Jeffrey Manufacturing Co.
  - Canadian Blower & Forge Co
  - Sturtevant, B. F. & Co.
- **Fans, Disc**
  - Canadian Blower & Forge Co
  - Jeffrey Manufacturing Co.
  - Sturtevant, B. F. & Co.
- **Fans, Multiblade**
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- **Fans, Propeller**
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- **Filters, Water**
  - Laurie & Lamb
- **Fireproofing**
  - National Fireproofing Co.
- **Fireproof Doors and Windows**
  - Mussens Limited
  - Ormsby Company, A. B.
- **Fire Escapes**
  - Canadian Des Moines Steel Co.
  - McGregor & McIntyre
- **Fittings**
  - Crane Limited
- **Fixing Devices**
  - Inventions Limited
  - Rawplug Co., of Canada
- **Flag Poles**
  - MacKinnon Steel Company
  - McGregor & McIntyre
- **Floor Clips**
  - Western Steel Products Limited
- **Floor Stands**
  - Jenkins Bros. Ltd.
- **Flooring Materials**
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  - Imperial Oil Company, Ltd.
  - National Fireproofing Co.
  - Symmes & Co., H. H.
  - Vitrified Clay Pipe Publicity Bureau
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  - Orton & Steinbrenner Co.
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  - Brantford Sand & Gravel Co.
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  - Lumsden Engineering & Transport Co.
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  - Crane, Limited
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  - Canadian Austin Machinery
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  - Clyde Iron Works Sales Co.
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- **Hoisting Apparatus**
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  - Canadian Ingersoll Rand Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Hopkins & Co., Ltd., F. H.
  - Industrial Works
  - London Concrete Machry. Co.
  - Mussens Limited
- **Hoisting Engines**
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  - General Products Co.
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  - Dominion Steel Products Ltd.
  - Kerr Engine Company
  - Gartshore-Thompson Pipe Co.
  - McAvity & Sons, T.
  - Hepburn, Ltd., John T.
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  - Muldoon, Ltd., J.
  - Standard Lime Co.
- **Ice Making Machinery**
  - Canadian Ingersoll Rand Co.
- **Industrial Cars**
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Hopkins & Co., Ltd., F. H.
  - MacKinnon Steel Company
  - Mussens Limited
- **Inspection Engineers**
  - Canadian Inspection & Testing Laboratories
  - Hunt & Co., Robt. W.
  - Milton Hersey Company
- **Insulating Compounds**
  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
  - Standard Underground Cable Co., of Canada Ltd.
- **Jib Cranes (all kinds)**
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  - Hamilton Bridge Works Co.
- **Joist Hangers**
  - Hamilton Bridge Works Co.
- **Kilns**
  - Canadian Blower & Forge Co.
  - Dominion Bridge Co., Ltd.
  - MacKinnon Steel Company
- **Lead Pencils**
  - American Lead Pencil Co
- **Lime**
  - **Muldoon, Ltd., J.**
  - Standard Lime Co.
- **Lockers (Clothes)**
  - Canada Wire & Iron Goods Co
- **Locomotive Cranes**
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co
  - Link-Belt Limited
  - Erie Steam Shovel Co.
  - General Products Co.
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - McGovern, T. J.
  - Mussens Limited
  - Orton & Steinbrenner Co.
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- **Locomotive Gasoline and Storage Battery**
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- **Ornamental Moulds**
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  - Barrett Company, Ltd.
  - Spielman Agencies Regd.
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  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd
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  - Imperial Oil Company, Ltd.
  - Lumsden Engineering & Contracting Co.
  - Standard Lime Co.
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  - Greening Wire Co., B.
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  - Canadian Ingersoll-Rand Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Canadian Pipe Co.
  - Dominion Concrete Company
  - Gartshore, Thompson Pipe Co.
  - National Iron Corporation
  - Pacific Coast Pipe Co.
  - Vancouver Wood Pipe & Tank Co.
- **Pipe (Steel)**
  - Canadian Des Moines Steel Co
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  - Inglis Co., John
  - National Equipment Company
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  - Dom. Tar & Chemical Co., Ltd.
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  - De Giorgio, Limited
- **Plastering**
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  - Hopkins & Co., Ltd., F. H.
  - Inglis Co., John
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  - Jenkins Bros. Ltd.
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  - Mussens Limited
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  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited

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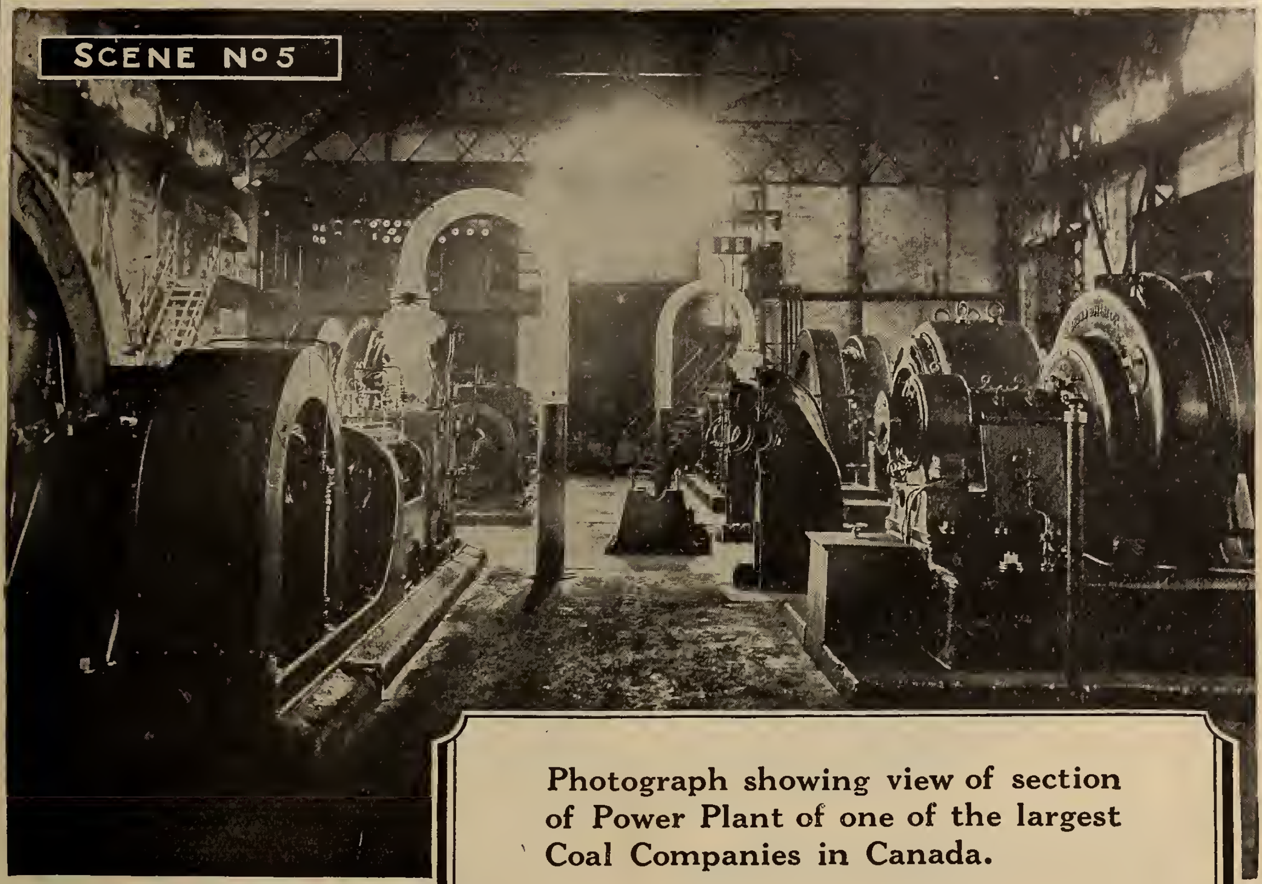

Photograph showing view of section of Power Plant of one of the largest Coal Companies in Canada.

All lubricants in use in this plant are supplied by Imperial Oil Limited.

IMPERIAL
LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS
Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
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ENGINE AND MACHINE OILS
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FOR VARIOUS INDUSTRIAL USES
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Imperial Cutting Oils
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Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.

Imperial Lubricants are speeding up production and cutting down operating costs in practically every line of Canadian industry. Engineers all over the country specify these oils for the most exacting lubrication jobs because they know their long-time record for satisfaction and dependability.

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IMPERIAL OIL LIMITED

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Gartshore, John J.
Hopkins & Co., Ltd., F. H.

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Burlington Steel Company
Canada Iron & Wire Works
Canadian Steel & Wire Co.
Greening Wire Co., B.

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Bates Valve Bag Co.

Refrigeration Machinery
York Manufacturing Co.

Rigging Screws
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Dominion Bridge Co., Ltd.
MacKinnon Steel Company

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Sarnia Bridge Company
Road Asphalt
Imperial Oil Company, Ltd.

Road Machinery
Canadian Austin Machinery
Can. Fairbanks-Morse Co., Ltd.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Sauerman Bros.
Waterous Engine Works Co.

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Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

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Roofing Cement
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Dom. Tar & Chemical Co., Ltd.

Roofing Material
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Brantford Roofing Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
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Rolling Steel Doors
Ormsby Company, A. B.

Sand
Allen Bros.
Brantford Sand & Gravel Co.
Greenbum Sand & Gravel Co., J.
Muldoon, Ltd., J.
Rogers Supply Co.
Standard Lime Co.

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Greening Wire Co., B.

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Rawplug Co., of Canada
Inventions, Limited

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Turbine Sewer Machine Co.

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Britnell & Company
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National Iron Works
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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
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McGovern, T. J.
Mussens Limited
Osgood Company
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Silo Moulds
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Inglis Co., John
MacKinnon Steel Company
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Standard Steel Construction Co
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Meldrum Iron Works Ltd.

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Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
MacKinnon Steel Company
Nova Scotia Steel & Coal Co.
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Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
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Toronto Steel Construction Co.

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Hamilton Bridge Works Co.
Horton Steel Works
Inglis Co., John
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Standard Steel Construction Co.
Sturtevant, B. F. & Co.
Waterous Engine Works Co

Steel Sash
Ormsby Company, A. B.
Can. Metal Window & Steel Products

Steel Wire Rope
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Greening Wire Co., B.
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Britnell & Company
Oakley & Sons, Geo.
Ritchie Cut Stone Co.
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Standard Lime Co.

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Canadian Ingersoll Rand Co.

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Canadian Des Moines Steel Co.
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Hagarty, R. E. W.
Hamilton Bridge Works Co.
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MacKinnon Steel Company
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Sarnia Bridge Company
Standard Steel Construction Co.

Swinging Gears
Clyde Iron Works
Dake Engine Co.

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Horton Steel Works

Tanks (Oil)
Canadian Des Moines Steel Co.
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Hamilton Bridge Works Co.
Horton Steel Works
Inglis Co., John
MacKinnon Steel Company

Tanks and Steel Pipes
Canadian Ingersoll-Rand Co.
Canadian Welding Works
Canadian Des Moines Steel Co.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.
Horton Steel Works
Inglis Co., John
McGregor & McIntyre
Waterous Engine Works

Tanks Wood
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company
Pacific Coast Pipe Co.
Dom. Tar & Chemical Co., Ltd.

Testing and Inspecting Bureau
Hunt & Company, Robt. W.
Milton Hersey Company

Tile
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General Products Co.
Italian Mosaic & Tile Co.
Winchester Cement Block & Tile Mfg. Co.

Tile Moulds
London Concrete Machry. Co.

Tile Drain
Erie Clay Products Ltd.
National Fireproofing Co.

Tile Hollow
National Fireproofing Co.

Time Recorders
International Business Machines

Towers
Canadian Des Moines Steel Co.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.
Horton Steel Works
Standard Steel Construction Co.

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Holt Manufacturing Co.
F. H. Hopkins & Co., Ltd.
Lorne Tractors
Mussens Limited

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Dominion Truck Equipment Co.
Holt Manufacturing Co.

Triangle Mesh Reinforcing Road and Pipe.
Canadian Steel & Wire Co.

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Federal Motor Truck Co.
Holt Manufacturing Co.
Jones Motors Ltd.

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Jeffrey Manufacturing Co.

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Wood Hydraulic Hoist & Body Co., Ltd.

Trussed Wire Lath
Greening Wire Co., B.

Turbo Undergrate Blowers
Sturtevant, B. F. & Co.

Turnbuckles
Dominion Wire Rope Co., Ltd.

Unit Heaters
Sturtevant, B. F. & Co.

Vacuum Cleaners
Sturtevant, B. F. & Co.

Valves
Canada Iron Foundries
Crane Limited
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Sturtevant, B. F. & Co.

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F. H. Hopkins & Co., Ltd.
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Laminated Materials

Waterproofing
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Symmes & Co., H. H.
Builders Iron Foundry

Water Meters
Neptune Meter Co.

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Prest-O-Lite Company, Inc..
Lincoln Electric Co., of Canada Ltd.

Welding and Cutting
Canadian Welding Works

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Canada Wire & Irons Goods Co.
Greening Wire Co., B.

Window Sash
Ormsby Company, A. B.

Wires and Cables
Greening Wire Co., B.
Standard Underground Cable Co., of Canada Ltd.

Wire Guards and Screens
Canadian Welding Works
Canada Wire & Iron Goods Co.
Canadian Steel & Wire Co.
Greening Wire Co., B.

Wire Rope
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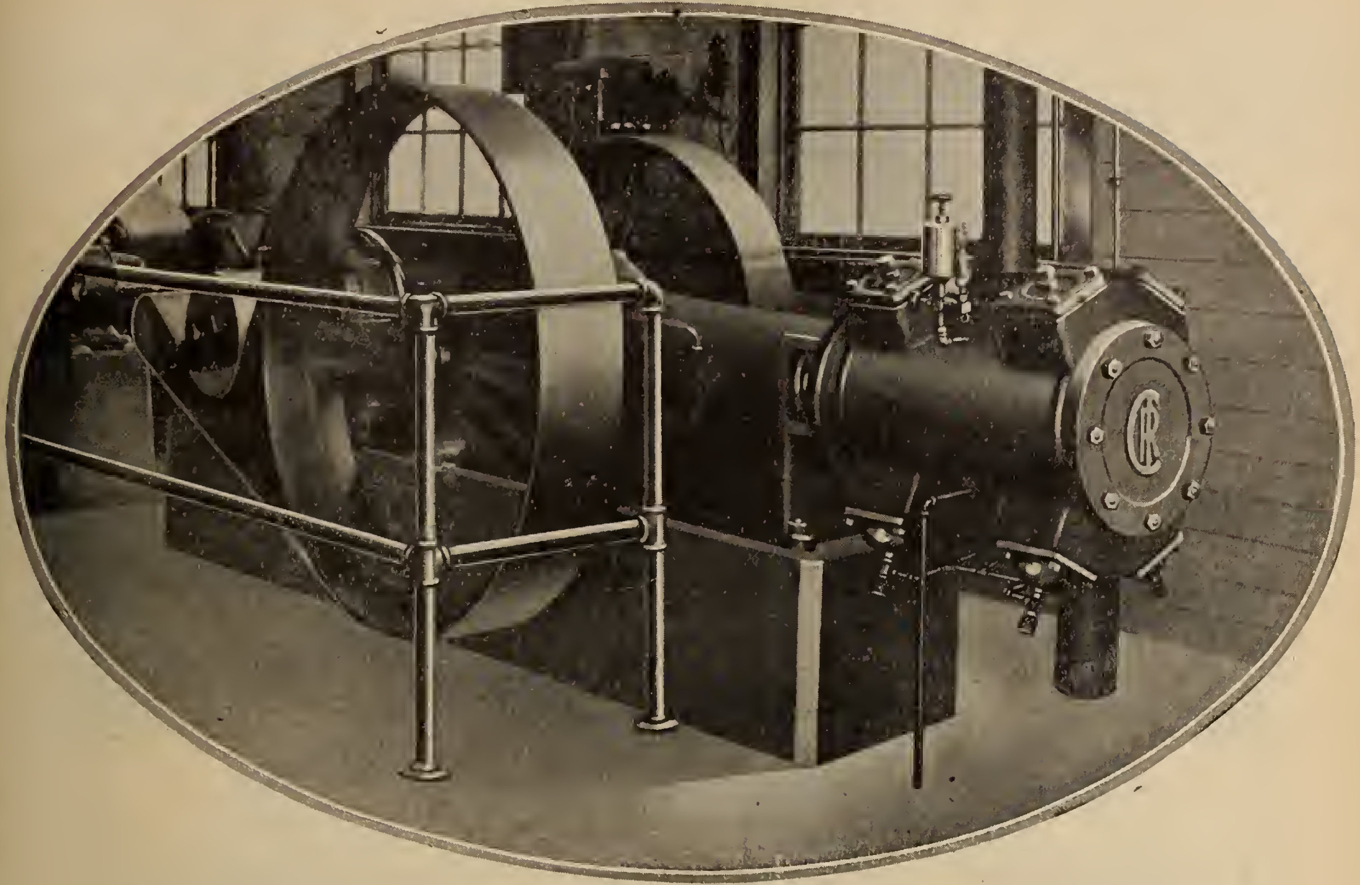
Dominion Wire Rope Co., Ltd.
Greening Wire Co., B.
Hopkins, & Co. Ltd., F. H.
Mussens Limited
Canadian Pipe Company
Vancouver Wood Pipe and Tank Company

Wood Preservations
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Woodworking Mach'y (Combination
Canadian Blower & Forge Co.



Modern Air Compressors

Modern air compressors have certain features which largely account for their high efficiency and uninterrupted performance.

Enclosed frame construction with automatic flood lubrication of main bearings, crank and crosshead pins and crosshead guides, resulting in a clean, easy-to-take-care-of machine and smallest oil consumption.

Small floor space and foundation because of compact self-contained design and correct distribution of forces.

Automatic and reliable regulation for loading and unloading the compressor according to the air volume and pressure required.

Admission to and discharge of air from cylinder with least friction loss due to the use of automatic Plate Valves with large and liberal free air passages.

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Winnipeg Nelson Vancouver

For the U.S. refer Ingersoll-Rand Co., 11 Broadway, New York, N. Y.
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Ingersoll-Rand

Installing Concrete Sewer
Guelph, Ont

Economy in Sewer Construction

Every growing municipality is continually adding to its mileage of storm and sanitary sewers. In many sections of Canada concrete pipe of high quality is available at a cost which makes it an economical material to use. Some cities and towns specify it exclusively for both storm and sanitary sewers. Many have used it for years with ever increasing satisfaction.

If you are interested in knowing of these experiences, write us for our literature on Concrete Sewer Pipe.

Specify
CANADA CEMENT
Uniformly Reliable

CANADA CEMENT
CONCRETE
FOR PERMANENCE

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Canada Cement Company Building Phillips Square Montreal

Sales Offices at Montreal Toronto Winnipeg Calgary

MUSSENS M LIMITED

PARSONS

For many years the E. R. Harding Co. Inc., Contractors Public Works of Racine, Wisconsin, have used Parsons trench excavators. At the present time they own one Model 48 and two Model 36 machines concerning which Mr. E. R. Harding writes: "We purchased one of your No. 48 excavators about six months ago for our work at Paducah Ky., laying 30-in. vitrified tile from 17 ft. to 22 ft. deep, and wish to say that the machine has given the best of satisfaction.

We have been users of the Parsons digging machines for many years and have worn out and junked two of the oscillating type, one 60-in. and the other 72-in. We also have and are now operating two No. 36 machines and they have always given the best of satisfaction."

Parsons machines are powerful tools with extraordinary digging capacities. Pick a Parsons and you will stop picking. Send for Parsons Bulletins.

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

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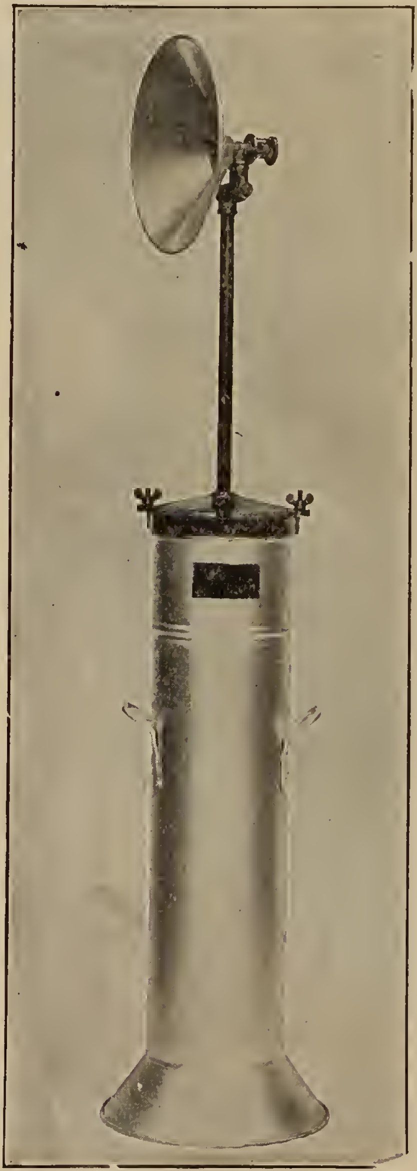

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BARBER-GREENE

No. 1 shows a Barber-Greene which provides a flexible loading system for the Pipkon-Marggraff Company of Milwaukee. The Barber-Greene requires only one man and can load a truck with 5 cubic yards in 3 minutes. Further details below.

No. 2 and 3 show a Barber-Greene being used for stripping by the Continental Products Company of Caledonia, New York. No. 4 shows Barber-Greene U-Type Conveyor used for loading gravel by the District of Burnaby, Canada.

Providing a flexible loading system for washed sand and gravel

A washed sand and gravel plant in Wisconsin had a difficult loading problem to solve. Its sand and gravel are pumped from the adjacent pit and are finally discharged into storage piles. Each size, of course, is stored in a different pile.

Very often the sand in these piles, except that at the edges, is too wet to be sold. In order to load all the salable sand as soon and as fast as possible, an extraordinary flexible method of loading had to be found.

After investigating, it was decided to use a Barber-Greene.

It proved that it could load a maximum of 250 cubic yards of washed sand and gravel per day.

It proved that it could load a truck with 5 cubic yards in 3 minutes.

It is operated by one man. No help is needed; the automatic disc feed cleans up as it feeds.

In every way Barber-Greenes provide the flexible fast, economical system of loading that the conditions require. They move around under their own power to a pile where there is sand or gravel of the right size that is dry enough to be sold. They load as many trucks there as there is material available and then move on to another part of the pile, or to another pile, and load there.

There are, of course, many other methods of using Barber-Greenes in sand and gravel plants.

For additional information send for our sand and rock handling literature.

Also note photograph No. 4 showing the Barber-Greene U-Type Conveyor.

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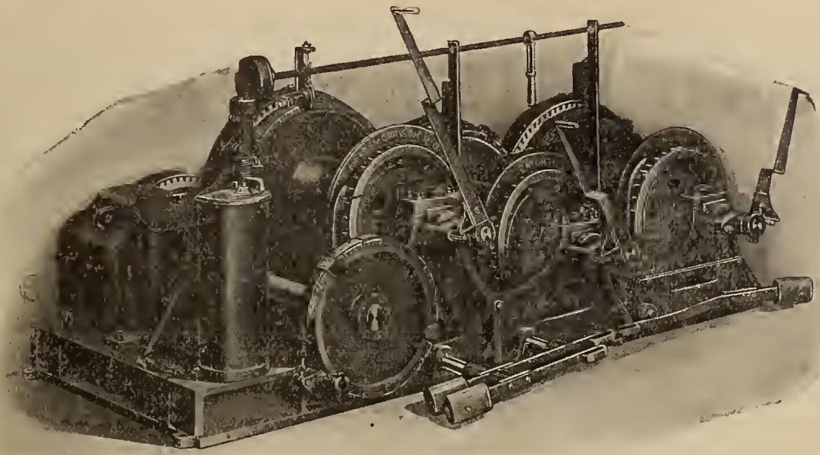

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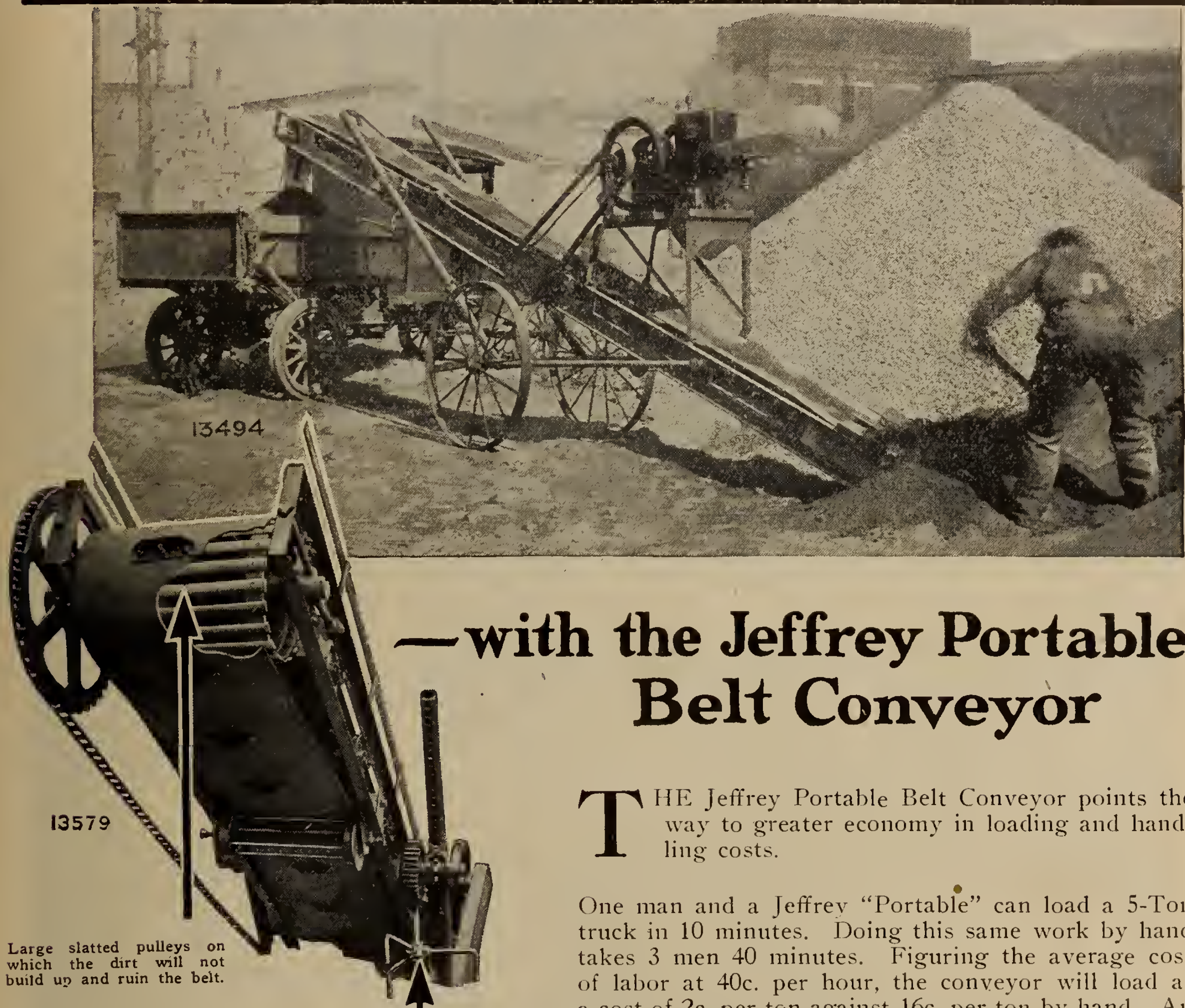

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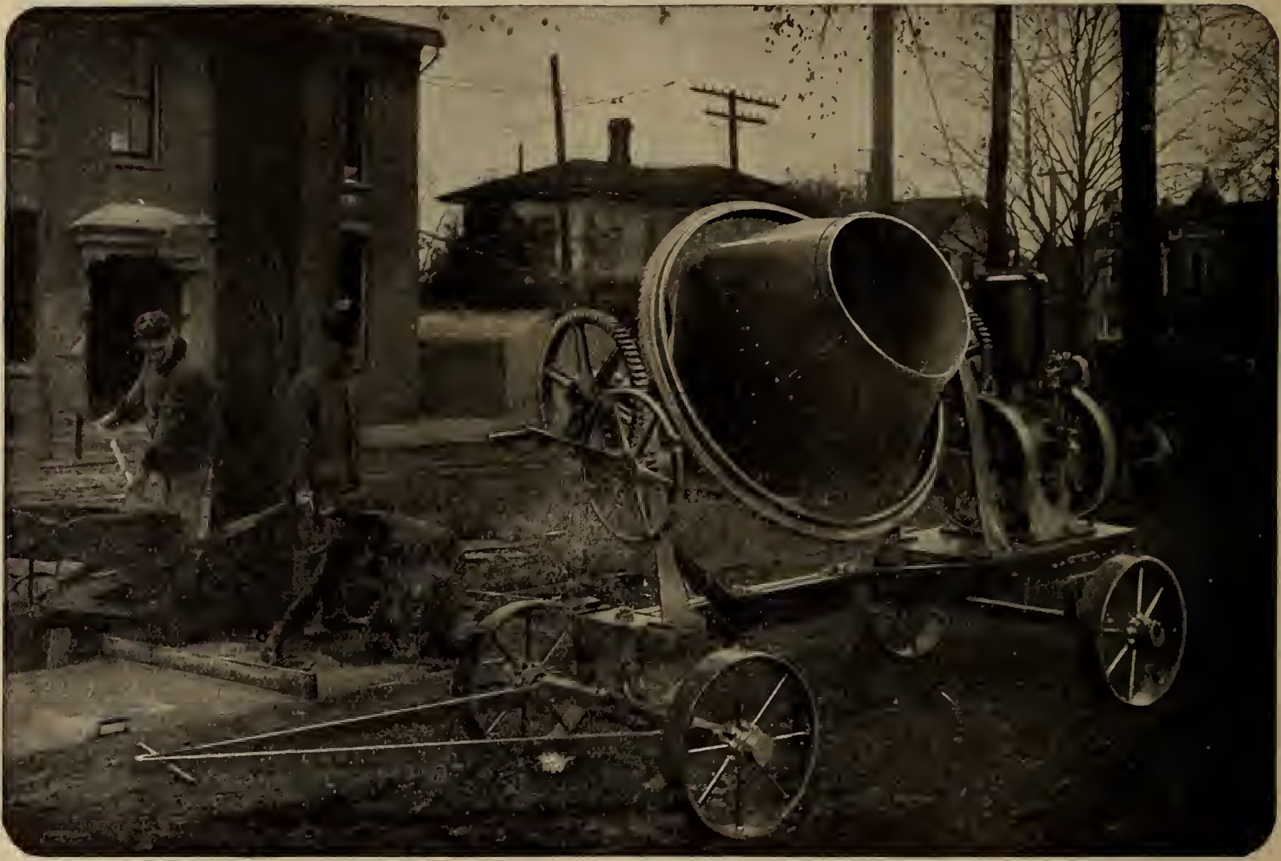

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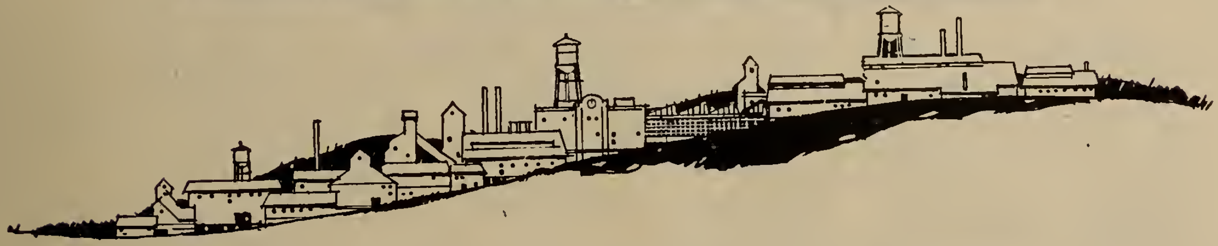

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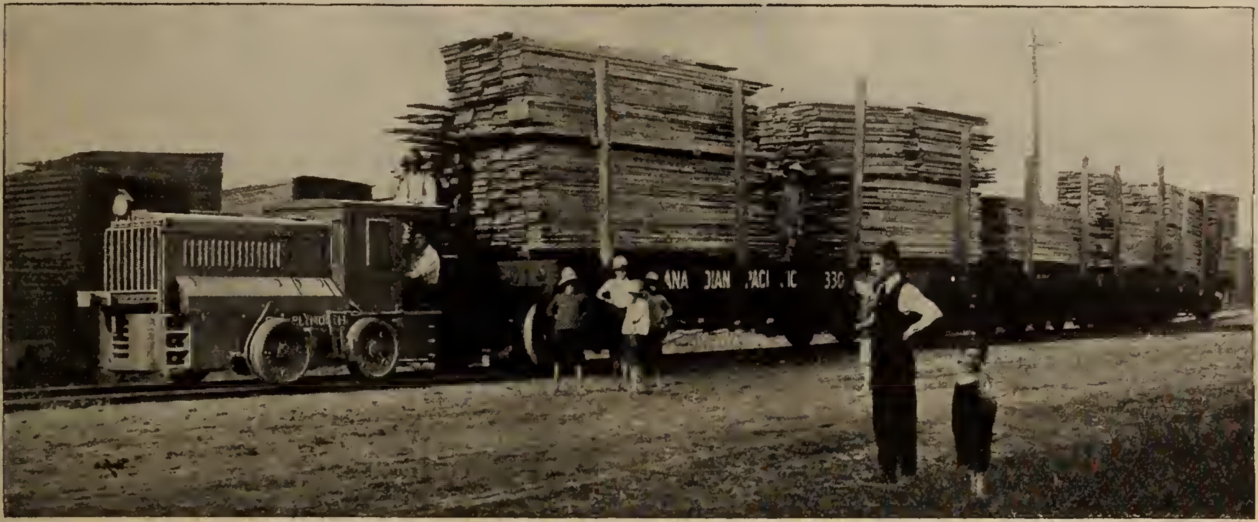

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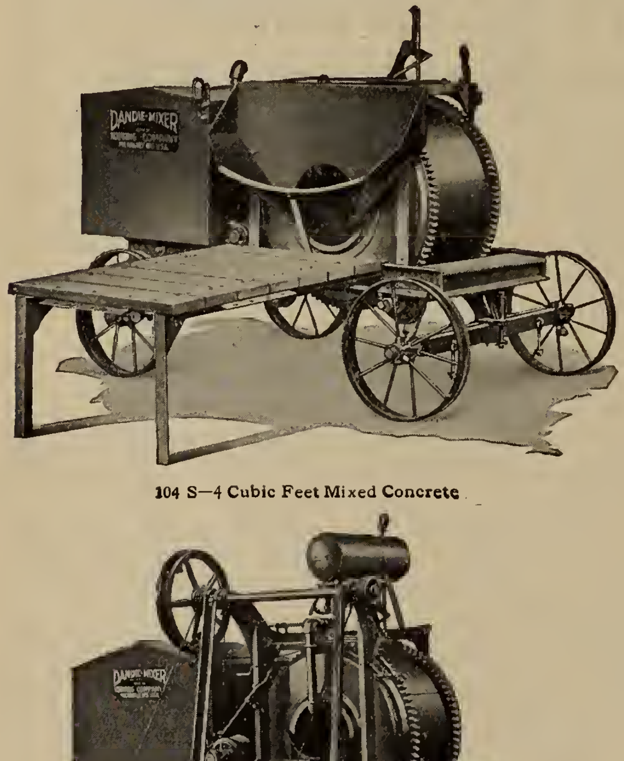

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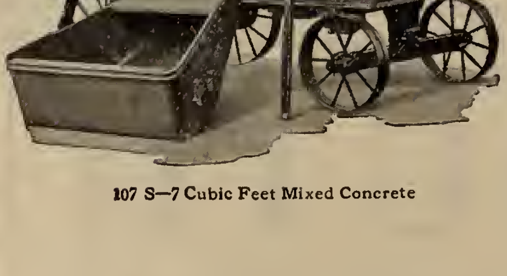

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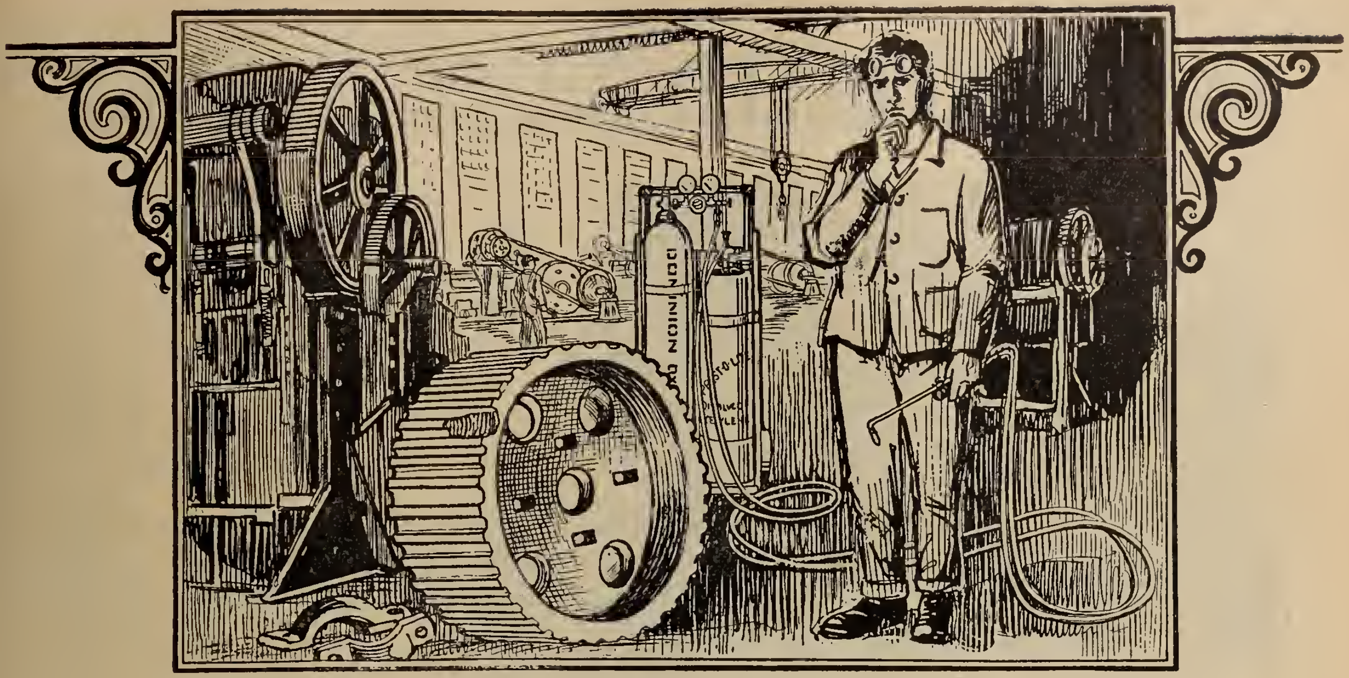

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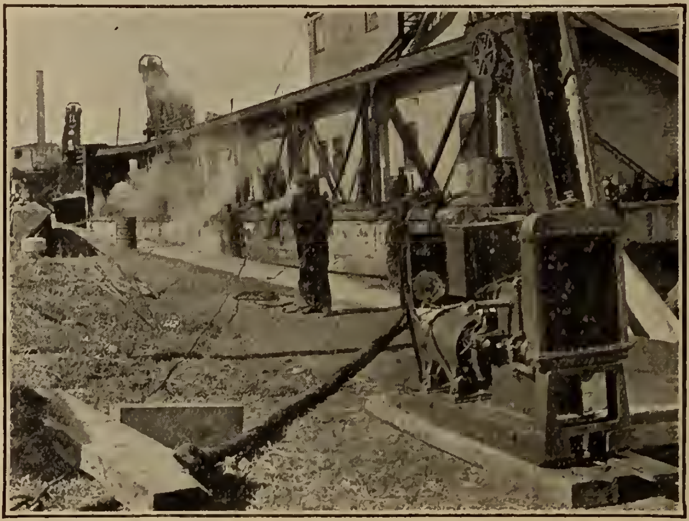

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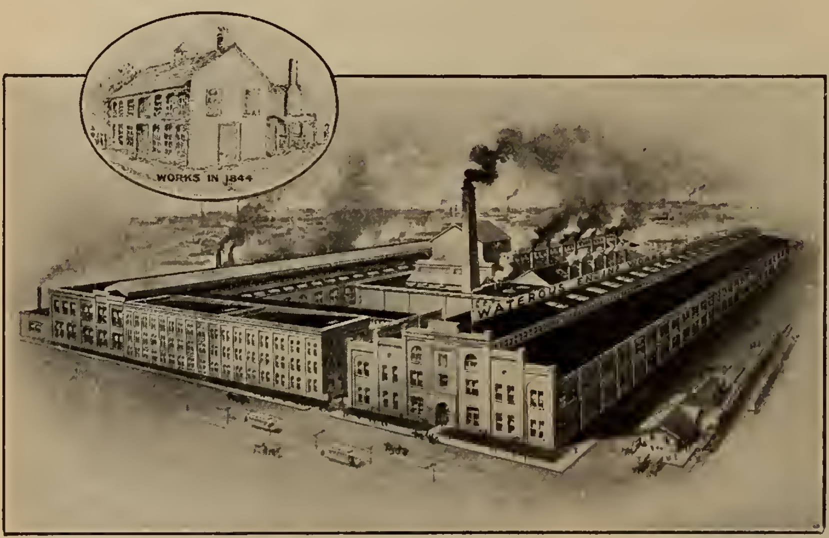

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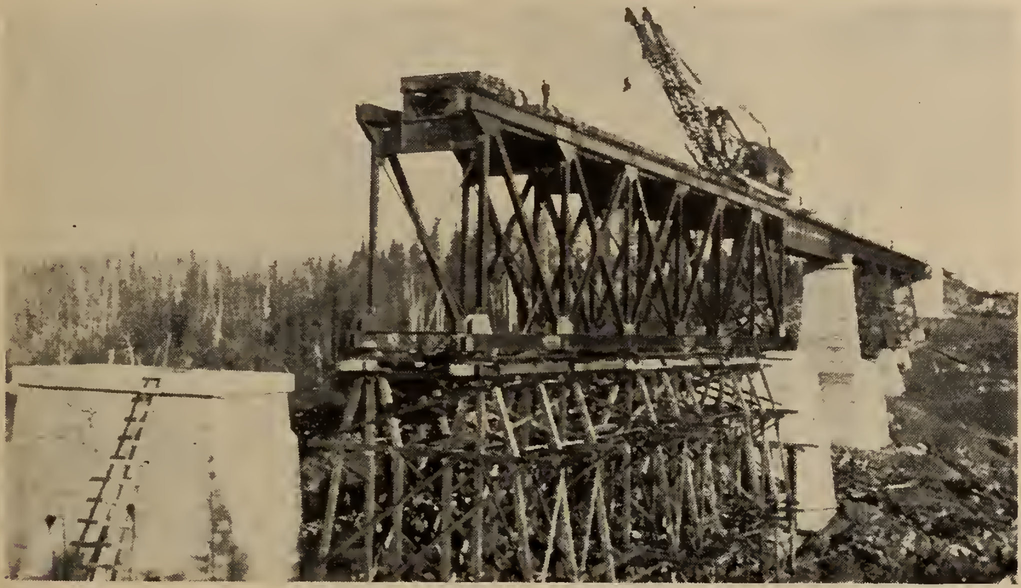


Bridge over Abitibi River, under construction

Interesting Railroad Construction in Ontario's North Country

70-Mile Extension of the Temiskaming and Northern Ontario Railway Northward From Cochrane Required Out-of-the-Ordinary Procedure—Large Bridges Over River Crossings

At the regular weekly meeting of the Toronto Branch of the Engineering Institute of Canada, on November 29, Mr. S. B. Clement, chief engineer of the Temiskaming & Northern Ontario Railway, read a most comprehensive and interesting paper dealing with the North Country and particularly with the T. & N. O's part in its development. Mr. Clement first sketched, in a historical way, the opening up of Northern Ontario and the development of the resources for which that country is noted. He then stressed the factors which led up to the establishment of the T. & N. O. Railway and those which have compelled an extension of the line into a hitherto unopened territory. The last half of this paper was devoted to a review of the various resources of Northern Ontario, which will be tapped by the T. & N. O. Railway and its proposed extensions. The significance of the pre-Cambrian area, in which category Northern Ontario falls, was explained by Mr. Clement, who saw in the more thorough investigation of that area, the possibility of almost unlimited and certainly unanticipated wealth and mineral value.

From Mr. Clement's paper are abstracted below portions which relate particularly to the construction features of the 70-mile T. & N. O. Railway extension from Cochrane northwards.

In selecting a route for the extension of the Temiskaming and Northern Ontario Railway for the purpose of developing the area between the Transcontinental Railway at Cochrane and James Bay, an endeavour was made to locate it through or convenient to areas that appeared to have the best prospects of an early industrial development. It was found that the most desirable route would be obtained by following the Abitibi River. This route would be through the better drained areas most suitable for settlement, it would cross a number of large rivers at points where pulpwood and timber could be collected for manufacture or shipment and would be close to a number of large water powers, the development of which would lead to the establishment of pulp and paper mills or other industries. It was also considered that any extension should be capable of being ultimately extended to a terminus on James Bay. The most suitable harbor on the bay was found to be in the estuary of the Moose with a site for a railway terminal on the west bank near Revillon's Post.

Comparatively light gradients, one half of one per cent, have been obtained with maximum curvature of four degrees. The grading is quite light except in the vicinity of Abitibi Canon, about 75 miles from Cochrane, where there will be four or five miles of heavy excavation, mostly in sand. The numerous river crossings will require comparatively heavy bridging.

Difficulties of Construction

The usual difficulties accompanying railway location in Northern Canada were met with. Supplies were largely taken down the Abitibi River, which was used as a base, by canoes in summer and dog teams in winter. Supplies for the last season's work on the Moose were sent in from Pagwa on the C.N.R. At this station the fur trading companies, each spring, float down large quantities of supplies on scows with the spring freshet. These go down the Pagwatchouan to the Kenogami River and thence to the Albany River. From Fort Albany they are taken to Moose Factory by schooner.

Only the first seventy miles from Cochrane are at present under construction. A general contract for clearing, grading, culverts, bridges foundation, tracklaying and ballasting was awarded to Messrs. Grant Smith & Co. & McDonald Limited of Vancouver in January 1922. The steel bridges are being supplied and erected by the Hamilton Bridge Works Co. of Hamilton. Grading having been practically completed for the entire 70 miles and track laid and ballasted to the bridge at the second crossing of the Abitibi River, 44.4 miles from Cochrane, it was recently found desirable to take the work out of the hands of the general contractor. This was done and since the first of November the Commission has been operating a tri-weekly construction service from Cochrane to Island Falls Jct. at mileage 43, where connection is made with a spur line three miles long to the Hollinger Power Development now under construction at Island Portage on the Abitibi River. Tracklaying and ballasting north of the second crossing will be completed by day labor next season.

The grading on this seventy miles was comparatively light, averaging about 16,000 cubic yards per mile. There was no rock excavation, except a few hundred yards in the bottom of two cuttings near the Sucker Creek crossing at Mile 20. The grading may be grouped under two types characteristic of the clay belt; the alternate cut and fill on the broken ground along the river and lakes, and the long low fills from side borrow across the swamps and unbroken country.

The material in line cuttings with the exception of the solid rock previously referred to, was of glacial origin. It varied from extremely fine sands and clays to coarse boulders and from complex drift to clays and sands of marked stratification.

Embankments are eighteen feet and cuttings twenty-four feet wide, and both were trimmed to slopes of 1½ to 1. The slopes of a number of the cuts were not stable at this angle and there has been some slipping and sloughing off but the yardage involved was not great. After track was laid, these cuts were ditched with a steam railway ditcher, loading into air dump cars which is the cheapest and most economical method of removing surplus material from cuts. A slope of 1½ to 1 is too steep for much of the clay. It is impracticable in railway construction to determine in advance the proper slope for each cut and it is more economical to subsequently ditch the cuts, where necessary by the above method than to excavate all of the cuts to an unnecessarily flat slope.

Land Slides and Settlements

There were no serious land slides. The slips in the cuts already referred to merely filled the side ditches and did not cover the rails. In making fills across creek beds, there were some settlements of the heavier filling through the muck to a firm bearing, the displaced material rising on either side. In a few instances during ballasting operations there were settlements of muskeg embankments. It does not appear to be practicable to anticipate these settlements. Although the muskegs are deeper and softer where the timber is sparse and stunted and wide crosslogging may be used under the embankments where considered necessary, generally this type of sink hole develops where least expected.

Landslides along the banks of many of the rivers in the clay belt, have been of frequent occurrence. A recent slide on the Blanche River in the fifth and sixth Concession of Evanturel, is of sufficient interest to be briefly described. This slide affected the west bank of the river for almost one half a mile and extended back, in places, for several hundred feet, and covered an area of about 50 acres. The original bed of the river was blocked and the water dammed back until it flowed over the narrow flood plain on the east side. At the lower end of the slide ,the bed of the river rose vertically about forty feet, while at the upper end, the original river channel was filled by the movement of the west bank. The slide appears to have been due primarily to the flowing of an underlying stratum of very soft viscous clay. The overlying stratified clays broke along horizontal and vertical planes. The bridge abutment shown was moved about 200 feet horizontally and 40 feet vertically.

Sand or gravel suitable for ballast was not found in quantity along the line of the railway. Some difficulty even was encountered in finding material suitable for trestle filling. Except for a small quantity of selected material, obtained from the trainfill pits, the bulk of the ballast had to be hauled from a pit three miles south of Cochrane. The scarcity of gravel will also make it necessary to haul ballast long distances in the event of the further extension of the railway to James Bay.

By reason of the scarcity of material suitable for aggregate for concrete, only a very few structures could be built in advance of tracklaying, and, except at the two large bridges over the Abitibi River at Mileage 11.4 and 44.4, track was carried over the streams on temporary structures.

The proportions of the concrete used were:

	Cement	Fine aggregate	Coarse aggregate
For reinforced concrete or concrete deposited under water	1	2	4
Mass concrete in forms	1	2½	5
Foundation concrete	1	3	6

The aggregate largely came from a gravel pit about one half mile from the track and five miles north of Cochrane. Fine aggregate predominated in the pit gravel and, to obtain proper proportions, a sufficient amount of screened, coarse aggregate was added.

Bridges and Culverts

Reinforced concrete or corrugated iron pipes up to three feet in diameter were used for the smaller waterways, and as far as practicable were teamed in the winter and placed in advance of the grading. The reinforced concrete pipes are preferable but corrugated iron are lighter and permit of easy handling and were used where the train haul was greatest.

Reinforced concrete top culverts were used where a greater opening was required than could be provided by a double 36 in. pipe culvert. Theoretically arch culverts are more economical in material, but a slight settlement of either bench wall results in serious cracks, if not in the complete failure of the arch. It is difficult to avoid settlement when on the softer clays, even when piling is used and to repair or rebuild a broken culvert under a high embankment and maintain traffic, is a costly proceeding. Scrap rail reinforcing is used throughout in this type of culvert. It accumulates in large quantities on railways and costs per pound but a fraction of the cost per pound of reinforcing bars. In many cases sufficient rail is used in the tops to carry the load and the concrete merely serves as a protection.

In crossing the larger streams, the use of high bridge abutments was avoided where possible, particularly on unsuitable material or on steeply sloping banks. A steel trestle was a type that was largely used. The length of the centre span is, of course, fixed by the width of the stream but for the approaches 35 ft. towers and 55 ft. spans are standard.

Where foundations are good as on solid or loose rock, and within certain limitations as to height, a reinforced concrete abutment with concrete slabs has been successfully used and is more economical than a U-type abutment. All bridges were designed for E-60 loading and in accordance with Canadian Engineering Standards Specifications with B. C. fir decks.

The bridge over the second crossing of the Abitibi River on the T. & N. O. Ry. Construction being carried out by the Hamilton Bridge Works Co., Ltd.

The bridge at the first crossing of the Abitibi River, Mile 11.3 consists of one 75 ft., two 110 ft. and three 90 ft. deck plate girder spans, supported on concrete piers and abutments. The footings in all cases were on hard pan. In the design of the bridge, provision was made for the raising of the level of the river that would follow the development of the Long Sault Rapids water power. A pool elevation at approximately the level of the tail race at the Iroquois Falls plant of the Abitibi Power and Paper Co. was assumed, and in anticipation of navigation of this pool, a clearance of 14 ft. was provided. Apart from this restriction longer deck truss spans in place of the 110 ft. plate girders could have been used.

Satisfactory concrete gravel was found on each side of the river within teaming distance. Simple concrete mixing plants were installed on the top of each bank. The south abutment and piers No. 1 and No. 2 were poured from the south bank and the other piers from the north bank, all but pier No. 2 in advance of tracklaying.

In this structure there are 869,519 lbs of steel and 3142.5 cubic yards of concrete.

An unexpected summer flood of unprecedented volume swept away the cofferdam for pier No. 2. The work on the other piers was well advanced and to avoid several months delay to tracklaying, temporary construction was used in place of the two 110 ft. deck plate girders between piers No. 1 and No. 3. Three 55 ft. deck plate girder spans already fabricated for one of the steel viaducts and a short length of timber trestle at each end were used to span the opening. Timber bents built on the cribs of the cofferdam supported the abutting ends of the girders, thus avoiding the placing of piling in the deep and swift channel. On the completion of the pier, the temporary work was removed and the 110 feet spans placed in permanent position. The timber in the temporary structure was used again elsewhere for false work.

Second Abitibi Crossing

The other crossing of the Abitibi River is at Mile 44.4, midway between the Carrying Places and Island Portage. On the completion of the Hollinger Power development at Island Portage which is one and one half miles below the bridge site, the level of the water will be raised to the foot of the Long Sault Rapids. A 220 ft. deck truss spans the present river channel and clears the regulated water level by 7½ ft. Deck plate girder approach spans provide additional clearance for navigation. The total length of the bridge, 670 ft., comprising five 55 ft., two 35 ft., and one 100 ft. deck plate girder spans and one 220 ft. deck truss span.

The steelwork is carried on concrete piers and pedestals, all of which are on solid rock except the south abutment and adjacent pedestals, which are on hardpan. All concrete was mixed in a plant at the top of the south bank and was spouted to and then elevated at piers "C" and "A." Concrete for the north end was spouted to cars and trammed across a suspension bridge and then elevated and spouted to the forms. This suspension bridge was so adjusted that both loaded and empty cars crossed by gravity, except for the last few feet at each end where they required a little assistance.

The erection of the truss span involved the placing of false work under considerable difficulty. The current is very swift and deep and the bed of the river is bare rock. To hold the piles for the falsework, cables were stretched across the river between the main piers. Staging on these cables held the top of the piles while the bottom of each pile was held against the current by a long wire anchored to a projecting rock, a short distance above the bridge. On these piles timber towers were built under the alternate panels. In this structure there are 1,615,123 lbs of steel and 3,685.8 cu. yds. of concrete.

How Should Contractors' Equipment Rental Charges be Computed?

Fundamentally, the Problem is One as to the Cost of Owning the Equipment— A Rational Method Outlined in an Analysis Prepared for the A. G. C. Committee on Methods

By STANLEY STOKES

A rental charge should include the total cost of owning a machine plus a reasonable profit on the rental transaction. The question as to how a rental charge should be built up is fundamentally a question as to the cost of owning the equipment. Having obtained this cost, we then add a profit on the rental transaction and have the total amount which should be obtained as rental. There then remains only the problem of the best and most practical way of distributing this charge. Therefore the problem can first be examined with respect to the cost of ownership.

The several items constituting the cost of ownership are as follows: Interest on original investment, taxes and insurance, depreciation, maintenance, general expense and profit.

Let us now examine each of these items more in detail.

The Cost of Borrowing Money

Under the heading of interest we must include the total cost of obtaining money. This cost varies considerably, depending upon the nature of the loan, whether a short-time bank loan, a real estate mortgage, a bond issue or various other possibilities. The nominal rate of interest is not sufficient to cover all expenses. For example, on a bank loan, the interest is usually figured as a discount. Thus if you pay 6 per cent. for $100.00, the $6.00 is deducted in advance and you obtain $94.00. This is at the rate of 6.38 per cent. If you make a real estate loan, you usually have a commission of 3 per cent. on a 3-year loan, or at the rate of 1 per cent. per year plus title examination and recording fees, which with a nominal rate of 6 per cent. makes your money cost about 7¼ per cent. If you borrow money in the form of a bond issue, you have some legal expense, brokerage charges, printing expense and other items which add from 2 to 3 per cent. to the nominal rate. Thus a 5 per cent. bond issue may cost you 1 per cent. to make the issue, with brokers' fees of 2 per cent. and an additional 1 per cent. for printing and other items, leaving you a net amount of $96.00 out of each $100.00 worth of bonds. You pay 5 per cent. on the $100.00 or $5.00 per year, for which you receive the use of $96.00, making your interest rate 5.2 per cent. This would represent an extremely high-grade security.

Considering all these items, a fair interest in normal times for short-term money would probably be not less than 7 per cent. It should be noted here that it makes no difference whether you borrow the money in a small amount for a particular construction machine or whether you have a certain amount of borrowed money in total for the business sufficient to furnish working capital and buy machinery as needed. The latter is more properly the way to regard it, so that the proper interest rate for a construction machine would be the same as the average cost of money for the business.

Taxes and Insurance

Taxes as such are only too familiar today, no further discussion being required. In a city, the usual personal property tax rate is about $2.50 on each $100.00 of the assessed valuation. The average assessment for the life of the equipment probably would not exceed 40 per cent. of its original cost. Automobile trucks and similar equipment may be assessed higher, but would be offset by the lower rates on other equipment. However, a frequent error is to assume that personal property taxes are all that should be considered. For example, other taxes are auto license, chauffeur's license, contractor's license, engineer's license, capital stock taxes and, above all, income taxes. Due to the fact that the contractor turns over his investment frequently, the income tax when expressed as a percentage of invested capital must necessarily be numerically large. An investment of your own particular taxes expressed as a percentage of your invested capital may surprise you, if you never carried out the computation.

The amount of insurance carried by the contractor on his equipment will vary with the nature of his business and the character of machinery in use. This item will include fire insurance, boiler insurance, collision and public liability on auto trucks, etc. A study of your own premiums will show you how much you should include for the various classes of equipment owned and rented. Workmen's compensation or employees' liability insurance is not to be included, but considered an overhead expense on the pay roll.

Continuity of Investment

A fundamental concept which must be grasped in order to properly analyze the problem of depreciation is that of continuity of the original investment. This means that the total original investment must be considered to be outstanding continuously. If you want to be able to use a steam shovel, someone must be standing that investment, whether you own it, whether you rent it,, or whether you buy it. If such a shovel in your organization or others is to be available, then someone has an investment in that shovel to the amount of its original cost. To some who feel differently about this problem and would like to consider the original investment as constantly decreasing throughout the life of the equipment, we ask that they be patient with us until we have completed this discussion.

Depreciation in its broadest sense includes all losses in worth arising from physical or functional deterioration which cannot be overcome by current maintenance. Depreciation arises from the following causes: Wear and tear, obsolescence due to new inventions and advance in the art, inadequacy, and catastrophes not insurable. i. e., extraordinary contingencies, floods, etc.

A depreciation reserve is necessary to maintain the original investment intact. In other words, the depreciation reserve plus salvage value of the property should always equal the original cost. In this connection, it becomes necessary to explain what is meant by salvage value. This value is either (a) scrap value, or (b) resale value at the end of a predetermined period. For example, the salvage of a heavy engine such as the Corliss engine is usually taken as the scrap value of its component parts. It is presumed that the engine will run until either worn out or other circumstances force it to be replaced. It usually has no resale value and the most that can be realized is its scrap value. On the other hand, an automobile truck is used for a few years and sold before it is completely worn out. The second-hand market value of such a truck is fairly well determined depending on its age. It makes no difference which type of salvage value is used, the difference between this value and the original cost being the total amount of depreciation. In computing allowances for depreciation reserve, the "depreciation base", to be used is the "wearing value." That is, original cost less salvage value.

Distribution of Depreciation

The question of the preservation of invested capital being temporarily conceded, the problem becomes that of the distribution of depreciation as part of the cost of the output of service. It is frequently suggested that certain physical property which is in perfect operating condition is just as valuable as though it were new, inasmuch as it performs the function for which it was acquired. It is obvious, however, that at some time it will cease to perform this function and that during this interval it will change from a valuable machine to one of no value. The only logical way to regard this change is that it took place at a uniform rate. This concept has to be modified in connection with renting equipment, but is considered as a part of the subject of depreciation. Modification will be discussed later.

As a practical application, let us assume the following examples:

Original cost of the machine	$1,000
Salvage value at end of 5 years	$250
Wearing value to be depreciated	$750
Average depreciation per year	$150
Per cent per year of the original cost for depreciation only	15%

At this point it should be mentioned that there are various methods of setting up depreciation reserves which are known as straight-line methods, sinking fund methods, and others. These will be referred to again.

Maintenance expense includes all repairs or replacements of part of the unit so that it may continue to operate at as nearly its original efficiency as possible. The amount of maintenance depends solely on the type of the machine and has to be estimated from records of similar machines over a period of years. In addition to ordinary repairs, after each extended period of service, a general overhaul is usually required. This is a proper charge to maintenance. For example, if a machine be rented, even though the renter agrees to maintain the machine in working order at his own expense, still the owner should give it an overhauling when he gets it back, knowing that the only maintenance that the renter will give it is that necessary to keep it in operation.

General Expense

General expense which includes expense of general office, general supervision not properly chargeable to individual jobs, office rent, stationary, printing, postage, and other such items, which are computed from experience as a percentage of the preceding total, in figuring a construction estimate, are likewise applicable to construction equipment. These expenses can be readily determined for a particular business. Such expenses may fluctuate widely as between contractors, due usually to a different method of bookkeeping rather than to any economy which one may obtain over the other. That is, one individual may attempt to charge specific work with a greater percentage of the overhead expense than another. For the purpose of this discussion, without attempting to specify a correct amount, we shall use 10 per cent. of the total preceding expenses as a fair overhead expense.

Profit on money invested in construction machinery should be computed at that rate which would be considered reasonable for the business as a whole. This profit, together with interest paid for the use of money, is usually combined and referred to as "return on investment." The determining factor which fixes a fair rate of return is the risk of the business. Whereas 4 per cent. may be sufficient return on Government bonds, 30 per cent. may be low for a speculative enterprise.

Suppose, without in any way attempting to state what is a fair return on money invested in the contracting business, that for an illustration we assume 10 per cent. Restating our original example, then. we have:

Original cost of machine	$1,000
Life	5 yrs.
Salvage	$250
Interest	7%
Taxes and insurance	5%
Depreciation	15%
Maintenance	8%
	35%
General expense (10% preceding total).	3.5%
Cost of ownership	38.5%

The figure of 8 per cent. maintenance was assumed to have been estimated from previous experience on this machine. Thus, in this hypothetical case we find a total cost of ownership of 38.5 per cent. per year of the original cost of the machine. This would not be sufficient for an annual rental, but to that would have to be added a small profit on the rental transaction itself, which we might take as 3 per cent., making a total annual rental of 41.5 per cent.

This cost of ownership goes on continuously whether or not the machine is being used, and it is fair to assume that the depreciation takes place uniformly whether or not the machine is in service. Actually, the depreciation is more likely to take place more rapidly in non-use than when the machine is in service. The cost of owning such a machine per working hour is entirely a function of the number of hours worked. If we may define the load factor on the machine as the ratio of the hours' use per year to the total hours in the year, then a machine which works half of the time would have a load factor 50 per cent. The cost for the working period would then be the total annual cost divided by the load factor. Thus it is seen that a most economical operation requires continuous use of the machinery. This immediately suggests "off peak" rates for rental of construction equipment during period of the year when the machine is not working. This will be discussed in more detail under rentals.

Depreciation Reserves

There are several methods whereby a depreciation reserve may be set up, of which the three following are most important:

Sinking Fund Method—The amount set aside plus interest compounded annually is such that this sum will equal the original investment at the expiration of the life of the equipment.

Reducing Balance Method—The reducing balance plan charges off a constant percentage on the decreasing balance. This balance is obtained by subtracting the previously accumulated reserve from original cost. Such process is continued until the value has been reduced to that of salvage.

Straight Line Method—A uniform percentage is set up each year throughout the life of the equipment. No allowances are made for interest on accumulated reserve.

For detailed discussion of each plan reference is made to "Depreciation—Principles and Applications," by Earl A Saliers, 1922 edition, published by the Ronald Press Company, New York. Briefly, it may be said that the straight line method has the advantage of simplicity; probably gives as good a picture of the manner in which depreciation takes place as any of the other methods; the accuracy of apparently more refined methods is academic rather than real, as the error in assumption of probable life is so great that a refinement in interest charges is similar to measuring the first 5,279 feet in a mile with a 2-foot rule and the last foot with a micrometer. Further the simple method lends itself readily to a revision of the percentages set up to comply with experience. Particularly is this true for short life equipment.

As an example, on a $1,000 equipment having an assumed life of 5 years the sinking fund reserve would be 94 per cent. of the amount required for straight line basis. Thus an error of 6 per cent. in the assumed life would offset this. In the case of a water works with a major investment in cast iron pipe with a life of 50 years, the sinking fund method should perhaps be used. The reducing balance method was adopted and used to some extent in England, but rarely in this country.

As stated in the beginning, the rental charge should include the cost of ownership plus a reasonable profit. Having determined the cost of ownership and outlined the basis of a reasonable profit, the rental problem reduces to that of finding a practical method which will obtain the necessary revenue over the period of the life of the equipment and at the same time distribute these charges in such a way as to be able to rent the machine in a competitive market. For example, inasmuch as the renter is likely to stand the cost of repairs while he is using the machine, he would be willing to pay more for a new machine than for an old one, although both machines are in good condition. Also, he might anticipate fewer breakdowns in a few months than in an old one. For this reason it seems desirable that the rental for such a machine be made higher during the earlier years of its life. In this connection, it may be noted that the maintenance in the earlier years would be less and vice versa. Thus a varying rental would result to some extent in the renter paying the same total cost throughout the life of the machine. Referring to our previous illustration in which our depreciation was 15 per cent. per year for 5 years, we might revise this for rental purposes as follows: First year, 25 per cent.; second year, 20 per cent.; third year, 15 per cent.; fourth year, 10 per cent., and fifth year, 5 per cent., for a total of 75 per cent.

This plan would probably appeal to the renter. It would be conservative in that it carries a depreciation reserve much faster than the straight line method. However, the rates for the early years should not be selected too high. In this connection it might be mentioned that a new company having a large investment in construction machinery might be able to make such heavy charges against its revenue without affecting its ability to pay dividends and thereby impair its credit. In other words, the straight line method of setting up the reserve seems desirable from the standpoint of owning the machine and of determining the total amount which must be derived when it is rented. The variable charge can be used merely as a means of establishing a rental charge, this latter method being a practical modification to meet competitive conditions.

Comparison of the Two Plans

Again referring to our example, with an annual rental of 41.5 per cent. on a $1,000 machine or $415, we reconstruct this on a varying basis as follows:

	1st year	2nd year	3rd year	4th year	5th year
Interest	7%	7%	7%	7%	7%
Taxes and insurance	5	5	5	5	5
Depreciation	25	20	15	10	5
Maintenance	5	5	8	10	12
General expense (10%)	4.2	3.7	3.5	3.2	2.9
Preceding total	42	37	35	32	29
Profit (3%)	3	3	3	3	3
	49.2	43.7	41.5	38.2	34.9

For comparison we would collect rental as follows by the two plans:

Year	Uniform Rates	Variable Rate
1	$415	$492
2	415	437
3	415	415
4	415	382
5	415	349
	$2,070	$2,070

It is apparent that the total annual cost of a machine is approximately a constant regardless of use and therefore increased use results in decreased cost per working hour. Thus, reduced rates could be calculated for any off-peak use which would serve to increase the normal use.

Rock Drills for Structural Work

In Addition to the Regular Applications of Tools of this Class, They Have Many Uses on Building Construction and Save the Contractor's Time and Money

By F. A. McLEAN

On bridge or structural work, in the installation of conduit, piping, motors, generators, machine tools, fire escapes, crane runways, shafting, steel door frames, window sashes, buffer plates, cornices, balconies, etc., it is often necessary to drill holes of various diameters and depths in stone, brick or concrete.

The usual method of drilling these holes with a pipe bit or a hand steel and hammer is by no means satisfactory for several reasons. Cutting speeds seldom exceed one foot per hour and the work is both costly and tiresome. It is almost impossible to strike the steel with a uniform blow and the holes are often larger than actually needed or are of irregular shape and need a lot of patching up with cement or mortar. This makes an unsightly job and sometimes an unsafe one as well.

Left—Drilling expansion bolt holes in concrete ceiling beam with the "Industrial Jackhamer." Right—Drilling holes for conduit

When there are a large number of holes to be drilled or where work is held up, pending the drilling of anchor bolt holes, the cutting or trimming of rock for a foundation or the installation of wiring or pipes, the cost of drilling the holes by hand may be far greater than the cost of the power drilling equipment necessary to do the work.

Holes Drilled in One-Fifth of the Time

Rock drills of various standard types have been successfully used by contractors on the heavier forms of this work for several years. A notable example of their value in this respect, occurred during the rebuilding of the Thomas A. Edison plant at East Orange, N. J. On this job it was found necessary to drill 9,500 holes in the concrete walls to take expansion bolts used for holding the steel window frames in place. Each hole was 3/4 in. in diameter by 3-1/2 in. deep. Through the use of a "Jackhamer" with a special extension steel the work was accomplished in about one fifth of the time that it would have taken by the hand method. Two men handled the drill, one holding the drill itself and the other guiding the bit. They averaged 500 holes a day, their work including the frequent moving of the scaffold and the changing of air connections.

This is a good example of a large number of small anchor bolts drilled economically. An example of a large number of large anchor bolt holes bored at low cost is found in the construction of the Quebec Bridge. On this job there were 176 holes, 4-1/2 in. in diameter and 5 feet deep, to be drilled through hard granite. The work was done by a "Calyx" chilled-shot core drill such as is regularly employed for testing pavement and exploring mines. On some occasions drills of this type have been known to cut without trouble through reinforcing rods and heavy steel 1-beams embedded in masonry.

One of the earliest known applications of rock drills for breaking masonry was for cutting out concrete and brickwork at the New York end of the Brooklyn bridge to make room for a subway terminal. Hand hammer drills of the one-rotating type were used, as neither the more suitable automatically rotated drills or the modern paving breaker had been developed at that time. The work necessitated cutting through, first, an 18-in. layer of fine cement concrete; next, about 3 ft. of rough gravel concrete; and finally, the brick supporting arches or vaulting. The material was cut away in layers or benches, first, the top layer, which though hard, was fairly uniform and good cutting; next, the rough concrete, which was

Left—Drilling anchor bolt holes in concrete floor with an "Industrial Jackhamer." Very high drilling speeds are made on this class of work. Right—An ordinary pneumatic chipper with a flat chisel is sometimes used for drilling through brick or concrete very difficult to cut; and then the brick which was comparatively easy to cut. In one instance it was found necessary to cut through a steel tie. This was accomplished with the same drill as was used for the concrete in the surprisingly short time of 12 min. Blasting was prohibited in this confined place—very close to one of the most congested of traffic arteries and these drills were called upon to pick out all the material piece by piece. For this work a solid hexagon steel with narrow-pointed chisel about 3/4 in. across the cutting edge was employed.

A tunnel was constructed in Seattle several years ago to connect the King County courthouse with the city hall. This work necessitated the removal of large concrete foundations, for which purpose a Jackhamer was employed. The drill was observed to work at as fast a rate as 1 ft. per min.

Large concrete foundations were removed by this method at the Brighton (England) Corporation Electric Works. The concrete was exceptionally hard and many of the broken blocks weighed as much as 20 tons each. An ordinary chisel bit, 20 in. in length, was employed for drilling holes all around the foundation, about 9 in. apart and 18 in. deep. The average speed of drilling was 7 holes per hour, that is, about 10 ft. of hole per hour.

Useful When Installing Equipment

A small rock drill has seen considerable service at a large printing plant. The floor construction is of concrete with brick arches, and the ceiling of tile. The space between the floor and ceiling is used for piping, electric wires, etc., and it is often necessary to cut holes in the floor or ceiling when installing machinery or lights. The drill takes its air from the regular 50 lb. air lines in the building. When cutting concrete flooring, one man can drill a hole through the floor (10 to 10½ in. thick) in 2½ minutes. Ladders or staging are required for ceiling work, and for such work two men handle the drill.

In another case where hanger holes were drilled in rock it formerly required a whole day for two men with hammer and steel to drill 9 or 10 holes, each 4 to 6 in. in depth, whereas now one man drills the same number of holes in 10 to 15 minutes with a hand hammer drill.

A simple attachment which converts an ordinary pneumatic chipper into a plug drill for boring holes in concrete floors, etc.

Hundreds of elevated-railway column foundations were removed in New York with the aid of jackhamers. These brick footings were located above the new subway in the lower part of the city and have been replaced by concrete foundations. These footings were in the shape of truncated pyramids eight or more feet high and about 4 ft. square on top. After the elevated structure had been supported on falsework, holes were drilled from 12 to 20 in. in depth. The brick was then broken out with sledge-and-wedge. The same type of drills are often found useful in bridge work for drilling or enlarging anchor bolt holes, trimming off piers, attaching girders to masonry supports at the shore ends, etc.

With the exception of such jobs as cutting large hard rocks for foundations, rock excavation, boring frozen ground or tearing out old concrete or masonry foundations, structural rock drilling requirements can often be met by a somewhat smaller and less powerful drill than the regular jackhamers. With this idea in mind, one company, the Canadian Ingersoll-Rand Company, has developed a very light hammer drill known as the "Industrial Jackhamer."

Drilling a plug and feather hole with a chipper-plug drill

Light Drill for General Work

The industrial jackhamer is designed for the use of contractors and general work around industrial plants, weighs 21½ pounds, uses ⅞" hollow hexagon steel with bits of up to 1⅝" in diameter, consumes 30 to 35 cubic feet of air per minute at pressure of 60 to 100 pounds and is adapted to all forms of drilling where the rock is not excessively hard and the depth of the holes required not over five feet. Its light weight and small over-all dimensions relieve the operator from unnecessary fatigue and enable him to drill a far larger number of holes in a given time than can be done by the best hand drilled. It is also easily operated in places that could not be reached by hand or with a heavier tool.

In general design the industrial jackhamer resembles the larger jackhamers, the valve mechanism and other parts being similar. All ports are short and direct the inlet being separate and distinct from the exhaust. The rotation is simple, sturdy, automatic and positive. A rifle bar and ratchet are located in the back of the cylinder and impart a rotary motion to the piston which in turn rotates the chuck holding the drill steel, on much the same principle as that made use of in the ordinary automatic screwdriver.

Plug Drilling Attachment

Where there is only an occasional need for drilling a limited number of small holes in stone, concrete or brick a plug drilling attachment will be found useful.

When applied to a chipper a simple plug drill is formed that will drill ¼" to ¾" holes to a depth of 6 or 8 inches at a rate of speed that far eclipses hand work. When the required number of holes have been drilled, the tool is quickly converted into a chipper again ready to do the work usually done by these tools. In addition it may be used for toothing out bricks, enlarging drilled holes, dressing up concrete and stone, etc.

The plug drilling attachment consists of an alloy steel bolt constructed so that a portion of the air from the exhaust of the tool is deflected and carried through a short hose to a special blowing attachment which clears the cuttings from the hole. A rotating wrench, hose connections and a diamond point or rose bit completes the outfit. The tool is held in one hand and a semi-rotary motion is imparted to the wrench as the drilling proceeds.

It is perhaps needless to point out that while the largest size of bits that are recommended for use with the industrial jackhamer and the chipping plug drill are respectively 1⅝ and ¾ inches, neither tool is limited to production of holes of these diameters or under, since a number of holes can be drilled very close together and the intervening webs then broken out by a few sharp blows from a hammer, by chiseling or wedging, or by holding the tool against them and turning on the air allowing the vibration to break them loose. Large holes drilled or cut in this way are generally more regular in shape than those cut by hand. This class of work is usually encountered where it is necessary to cut openings for belts, shafting, windows, etc.

Drilling overhead holes for steel window frames with an air feed stopehamer. The pneumatic feed cylinder at the bottom of the drill forces the steel upwards relieving the operator of the weight

When holes are drilled dry in concrete with hand rotated tools, the natural moisture present seems to cause the cuttings to pack and form a mud collar back of the bit making it necessary to withdraw the steel with a Stillson wrench causing considerable delay. This trouble does not occur with the automatically rotated type of drill because the air jet keeps the hole clean so that the steel can be easily withdrawn by means of the steel holder which is an integral part of the drills. The automatically rotated drill is also valuable when elbow room is restricted or footing insecure, as on ladders, false work or swinging scaffolds.

The drills previously mentioned will answer for practically all classes of rock drilling around the average structural job. Where a number of deep or fairly large overhead holes are required, however, it is sometimes more economical to use the "Stopehamer" type of drill employed for overhead drilling in mine raises and stopes. These drills are equipped with an air operated feed cylinder which forces the drill forward thus relieving the operator from the weight. Drills of this type are used either wet or dry, cut rapidly and are very easily controlled even in very close quarters.

This article does not by any means cover all of the possible applications of rock drills or structural work. The writer hopes, however, that some of the "kinks" will prove useful to those engaged in construction work.

Electric Hoists Prove Profitable for Handling Materials

In Manufacturing Plants, and Even on Construction Jobs, They Pile up Handsome Profits

By RUSSELL B. WILLIAMS
Link Belt Co., Chicago

In the solution of our transportation problems we spent many years striving to eliminate the human element from vertical handling. Though a man might more or less promisingly move an object along the floor, it required doubled and redoubled effort when necessary to reach new levels. So we invented continuous bucket elevators, spiral "Helicoid" conveyors, skip hoists, endless belt conveyors, platform elevators and other devices for the lifting and lowering of objects. And of these inventions few indeed have failed to far more than pay their way.

Now, there yet remained the problem of horizontal transportation. This presented difficulties, for in almost every instance, obstacles to progress were numerous. Machinery, work benches, piping, motors, everything on the floor, presented just that many reasons why the transportation of objects horizontally, by mechanical means, would be difficult

Solution of Horizontal Transportation

So, in the solution of this problem—in the very act of scratching our heads and looking upward—we discovered the ceiling! With practically nothing on it! We had built them on every house, barn and factory, but had failed to consider them good for anything but shelter and the suspension of a light or two. After the discovery of our own ceiling, the rest was comparatively easy.

Thus it was that the modern electric hoist was made possible, a thing of rapid and ready transportation in so many plants and in so many duties. For, with the electric hoist, everything mechanical is out of the way, yet instantly available. And the act of transporting objects is identical with that of man power. The electric hoist lifts the objects from the floor, carries them to the desired place and sets them down.

Electric hoists, as other machines designed for the transportation of objects, have proven an unqualified success. The economies effected through their wide application are on every hand, for they have long since passed the experimental stage and have received quite universal use.

Mr. Buhler, chief engineer for the Philadelphia (Pa.) Paper Manufacturing Company, for instance, employs two electric hoists; one in the removal of ashes from the boiler room, which hoist has been in constant use for over nine years, and one in the disposition of rubbish, carrying it from the mill to the incinerator.

In considering the savings or economies effected by the rubbish hoist, Mr. Buhler says: "It can safely be said that did we not have the electric hoist and were compelled to dispose of the rubbish by hand, it would be necessary to add two men to our payroll.

Three Link-Belt electric hoists handling structural steel to and from punch presses, welders, cutters, etc.

This extra help, at prevailing prices, would run into a $12 daily labor cost. Saving twelve dollars a day totals $3,600 annually, considering that we operate 300 days in the year. This is the gross saving effected by our electric hoist handling rubbish from the mill to the incinerator.

"Of course, to arrive at the net annual saving, it is necessary to deduct all expenses incident to the maintenance of this hoist. These expenses can be calculated as follows:

Interest on investment at 6 per cent.	$ 72.00
Depreciation on 10 year basis (conservative).	120.00
Repairs (estimated)	160.00
Maintenance—oil and attention	50.00
Total expense, yearly	$402.00

Thus we have an expense of $402.00 for a piece of equipment that is saving us in labor costs alone $3600. The difference, $3198.00, is the net annual saving."

Used for Dirt Disposal

A rather unusual application for an electric hoist is seen at the publishing plant of the "Boston American," where Adams and Pond, general contractors, have been employed in the excavation work that will enlarge the present building and make possible the installation of additional presses in the basement of their present building.

Because this excavating must be carried on without serious interference with the daily operation of the newspaper offices and plant, it is impossible to use a steam shovel or crane. Only a small portion of the floor could be removed, the dirt and refuse being compelled to come out of that "hatch way."

In order that this unusual condition might be met satisfactorily, an electric hoist was pressed into service. This hoist lifts large buckets of dirt and refuse from the floor of the basement to the street level, carrying them over the awaiting truck, where they are dumped, the bucket being returned to the basement for refilling. The capacity of this hoist is 12 to 14 trucks a day, each truck carrying the refuse of from 14 to 16 buckets.

If it were not possible to employ this Link-Belt electric hoist, it would be necessary to remove all the dirt and refuse by hand. And this would necessitate the construction of two shovel platforms, each platform requiring no less than three men with shovels. Not only would this slow down the work (it being impossible for these men to load this number of trucks a day) but the construction of the shovel platforms would make necessary the destruction of the present sidewalk, with subsequent replacement at the time the work was completed.

Thus this hoist saves the labor of six men a day, which at $4.00 a day totals $7,200 a year. This is the gross saving effected. The net saving is figured at $3,636.00, as the expense incident to the operation of this hoist must take into account the wages paid the operators, and are therefore very high. Its operation requires two men, in this instance, one acting as operator at $2,000 a year, the other dumping and caring for the buckets, at $1,200 a year. Kilowatt input, interest, depreciation, attention, etc., total $364 annually. This makes a total maintenance and operation cost of $3,564, leaves the above net saving. This annual economy does not take into consideration the value of the sidewalk, the possibility of moving the hoist to other work upon completion of the pres-

Electric hoist in power plant of Philadelphia Paper Mfg. Co.

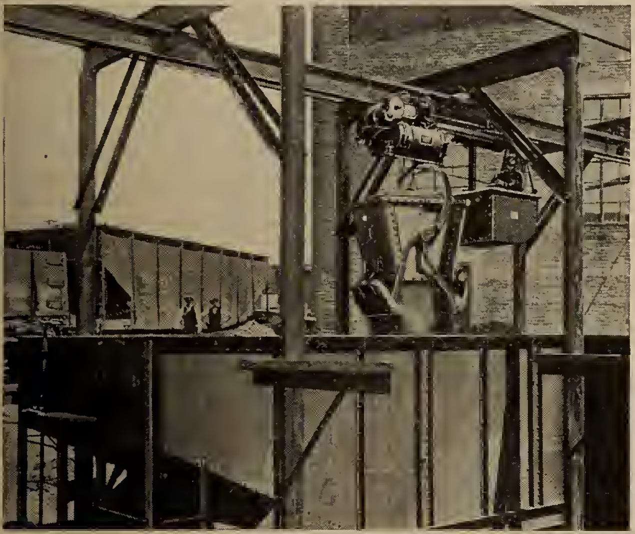
ent job, the increased tonnage taken away, or any of the other factors that would very materially enter into the investment return if closely figured.

Over 50 Per Cent. Saving a Year

Not infrequently there is voiced the belief that unless a piece of equipment can eliminate two or more men, there is little or nothing to be gained through its installation. Evidence to the contrary is to be had at the receiving station of the N. Ward and company, in South Boston, Mass. Here an electric hoist is used to transport large boxes of animal waste from incoming butchers' wagons, through the building to lighters or barges, which carry it to their island plant for transformation into fertilizer.

As this hoist is now operated, it saves the labor of but one man a day, which equals, in dollars and cents, $1,200 a year. As small as this saving may seem, it represents an investment return of well over fifty per cent. a year.

The electric power that operates this one-ton electric hoist comes through a separate meter, and it is interesting to know that although the hoist is in daily use and is being used an average of five or six hours every day, the power consumption has not exceeded $4.75 a month since its installation some six years ago. Oil requirements are normal. One quart of oil a week or approximately 12 gallons a year, is used. The repairs (purchased directly for this Link-Belt electric hoist) have been but $14 for the entire period of operation. There were, however, some expenses incident to the trackage, trolley, scales, and so forth. All told, the maintenance cost of this hoist averages $325 a year leaving a net annual saving from the elimination of one man of something like $675. And this return is from an original outlay of about $1000, which included a long, curved, hinged track, trolley, and complete equipment.


Delivering ashes from the boiler room to gondola cars at plant of Philadelphia Paper Mfg. Co., with an electric hoist

In this advanced mechanical age, the ability to move objects is the determining factor in the progress of industrial concerns. To those who can move their materials most rapidly, cheaply and efficiently, is accorded the largest measure of success.

Correction

Our issue of November 28 contained an item to the effect that the Board of Control at Toronto had awarded a contract for $200,000 worth of cast iron piping to a British firm. This report was in error. The awarding of the contract to the British firm was approved by the Board of Control, but voted down when submitted to the council.

Air Drills Make Record at Shawinigan Falls

In carrying out their operations at Shawinigan Falls, Que., the Grenville Crushed Rock Company has to deal with rock consisting of soft and hard layers of granite full of slips and with small bodies of white quartz scattered throughout it. The layers of granite vary greatly in hardness, sometimes cutting freely for four or five feet and then running hard from four to six feet. These facts are mentioned in order that the following figures may be duly gauged.

The company has on this job three Leyner-Ingersoll X-70 rock drills, and since the first of these tools was employed the management has kept a record of their performances. The results are extremely suggestive, and show what can be done under unfavorable circumstances. During the month of July past, an exact record of the footage drilled and time consumed was kept for each drill. All the machines were fitted with standard 1-1/4-inch, hollow, round steels, with "Leyner" shanks. The starter bits were of 2-7/8 inch diameter, and 1/8-inch changes on 24-inch runs were used. The depth of holes drilled varied from 12 to 22 feet, while some holes were drilled to a depth of 28 feet. The air pressure employed ranged from 80 to 85 pounds. The thing that must be borne in mind is that the character of the ground made drilling at times extremely difficult because the rock prevented the rotation of the steels; and two of the drills had to contend with material of this sort for considerable periods. Work was carried on in 8-hour shifts.

Date	Drill No. 1	Drill No. 2	Drill No. 3
July 1	83 ft.		
“ 2	75		
“ 3	62		
“ 4	72		
“ 5	62		
“ 6	76		
“ 7	76	54 ft.	
“ 8	67	65	
“ 9	80	64	
“ 10	76	75	12 ft.
“ 11	64	74	52
“ 12	82	76	96
“ 13	92	105	103
“ 14	78	86	104
“ 16	75	74	89
“ 17	98	84	110
“ 18	87	74	64
“ 19	78	66	96
“ 20	79	53	103
“ 21	74	70	70
“ 23	88	75	104
“ 24	80	85	111
“ 26	45	60	83
“ 28	80	65	85
“ 29	70	55	
“ 30	49	45	52
“ 31	60	55	52
	2,008 ft.	1,460 ft.	1,386 ft

Average per hour, Drill No. 1, 9.3 ft.; drill No. 2, 8.7 ft.; drill No. 3, 10.2 ft. General average of 9.4 ft.

Considering frequent delays caused by bad ground, etc., the foregoing record is remarkable. There were no breakages of any sort; and on six different days drill No. 3 drilled more than 100 feet.

Time Control in Building Operations

The Preparation of a Progress Chart and its Uses in Ensuring Completed Work Within an Agreed Time Limit

By the Morton C. Tuttle Co., Constructors, Boston, Mass.

The industry of this continent is leading the world in most aspects of production, largely because of its ability to master the control of time. This is stating, in general, the ability of American industry to schedule its operations—to plan component parts of huge undertakings—so that a thousand activities may be co-ordinated and focused at a pre-determined point in a pre-determined manner.

The old time manufacturer, working on an output far simpler than today's, with his sources of material often conveniently near, and with a market lacking today's capriciousness of demand, handled his plant very largely but cut-and-dried methods, worked over time with his men when pressure was severe, and, sometimes, led them into the hay field when the season was slack. That implied, of necessity, a small plant, a limited output, and a labor force predominantly of native-born men able and willing to do a number of different things reasonably well and ready to make themselves quite at home in any one of a variety of situations.

But as output became more complicated, as the reach for supplies began to extend well around the globe, as huge but transitory markets began to develop, as specialists came into the field of management and of labor as well, as—perhaps most influential of all—costs began to increase and margins of profit to diminish, it became necessary to concentrate many small plants into one large factory, and, having so done, to lay down careful schedules of operations—to build the product on paper and then to control the time devoted to each process in its manufacture, so that all departments of a plant might at all times, in so far as possible, be carrying a balanced load; and, further, so that unlooked for delay in one quarter might be prevented from throwing sequential processes into disorder, at serious cost to the entire undertaking and to its sponsors. Thus it has come to be a recognized principle of the present industrial era that centralized control operating on a pre-determined plan is the root of successful manufacturing enterprise.

Construction Abreast of Manufacturing

But this wonderful development of planned control in response to the necessities bred of changing

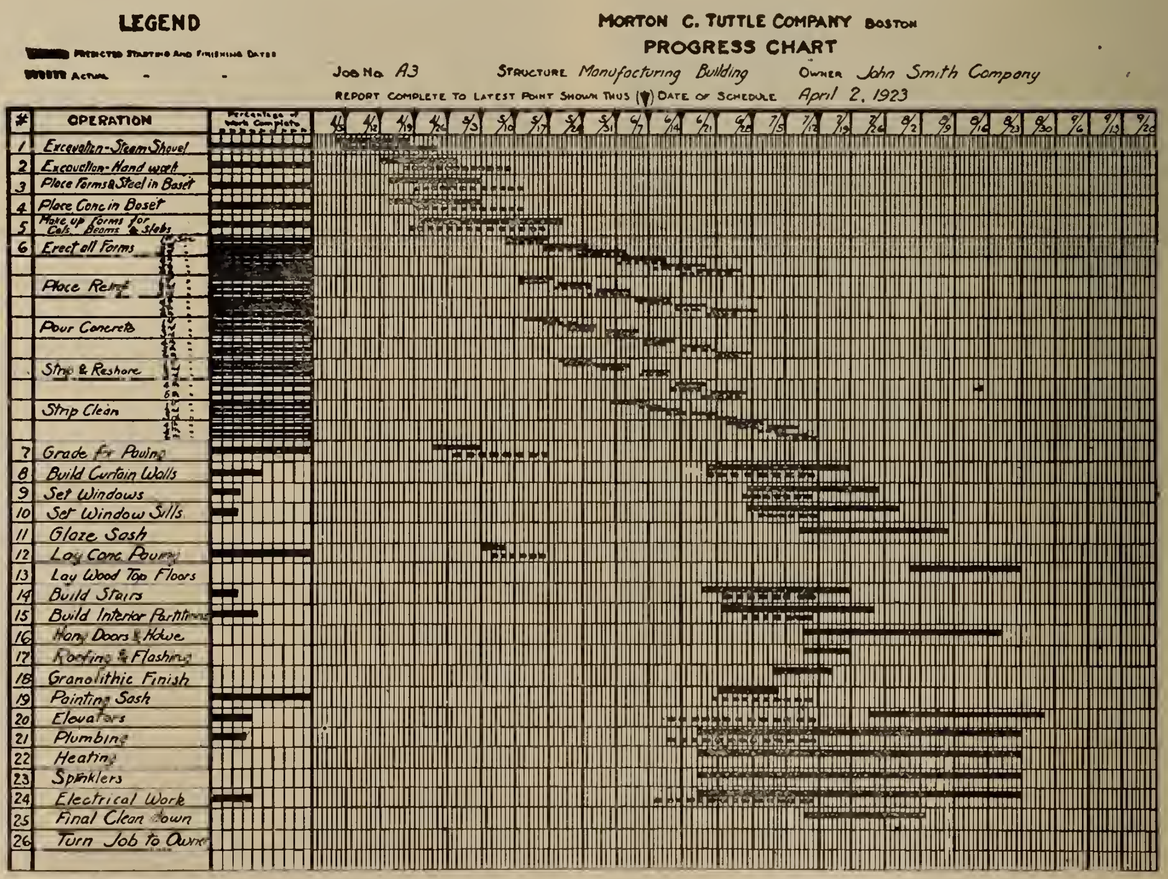


Fig. 1—A progress chart as arranged for scheduling and recording the time applicable to each process of a building operation. Solid horizontals in the date columns indicate plan; dotted lines indicate performance. Departures from the original plan are inevitable. This chart shows what has happened after fourteen weeks of work.

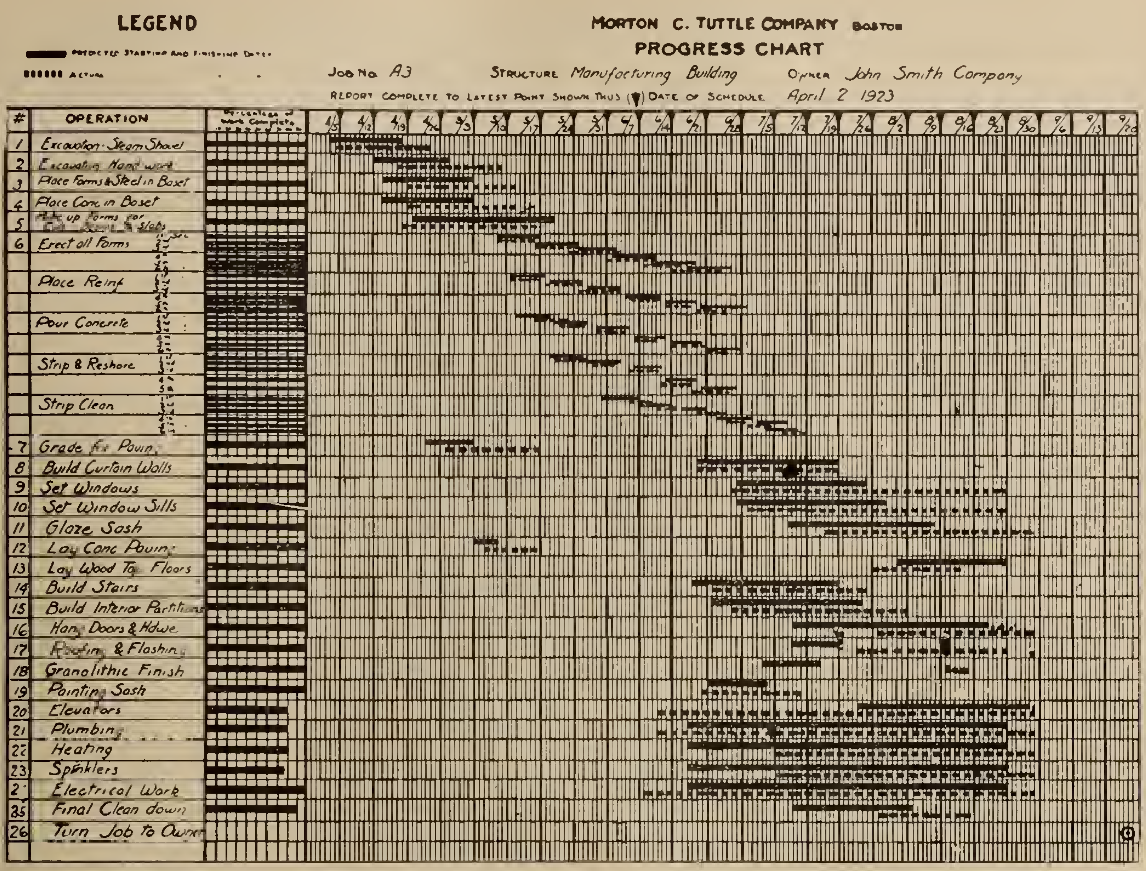


Fig. 2—The preceding chart, as it appears at the end of the twenty-first week of construction. It is inevitable in building that unforeseen delays, together with some alterations in the engineer's designs should occur, with consequent disturbance to schedules. By showing the exact status of each process at a given time the Chart facilitates readjustments and eliminates confusion. Delivery of the building on the promised date is here assured.

economic and social conditions, while true of manufacturing methods, is equally true of methods in the realm of construction. But here the truth is less generally familiar.

There was a time when two men could, without other aid, erect and equip a not inelegant dwelling house. A shop or small factory might prove an even less difficult undertaking. That time is gone. In today's factory we encounter a vast complexity of steel and concrete, curtained with glass, cobwebbed with electric wires, tunnelled with steam conduits, and populated with huge automatic mechanisms whose strength is that of a thousand giants, whose fragility that of a tiny strand of wire. Construction of such a plant calls for powers certainly no less alert and no less highly trained than those demanded for its operation after construction is complete. And, by the same sign, it calls for equally intelligent preliminary planning and equally effective time control.

Some construction companies have realized this and have kept, if anything, rather more than abreast of modern methods of planning, scheduling, and supervising their operations. In some instances, their procedure is such that it is worth recording, not only for the general interest and benefit of others similarly engaged in building, but, as well, for that of industrial managers still on the alert for profitable suggestions from whatever source.

The basic secret of successful construction may be stated almost in a word: it is that of getting the right men and the right materials, in right quantities, at the right place at the right time. And the essence of all this rightness is time. Control of the time devoted to each part of an enterprise means control of the time necessary to its entire completion. Obviously this entails a preliminary plan, which, as actual performance is checked against it, may become a record of progress. And, since such a plan is most readily available when reduced to the graphic form of a chart, it is pretty certain, in due course, to assume both the name and the function of a Progress Chart.

The type of Progress Chart utilized in our company is illustrated in figures 1 and 2.

In this, it will be observed, the entire future operation is analyzed into its main processes, which, listed and numbered in convenient sequence, are posted as the dominant column of the chart. In an adjoining column, space is provided for registering the percentage of completeness of each process on the date of filing the record. As many other columns as there are weeks allotted to the finishing of the entire undertaking are likewise provided. Each of these is identified by a date heading.

Before any work begins, this chart is made ready. The processes are listed, and opposite each one is drawn, in the dated columns, a solid horizontal line, which starts under the date scheduled for beginning the process and ends under the date scheduled for its completion. As actual work proceeds, a dotted line, entered each week below the solid one, shows how performance accords with expectation.

Recorded Experience; Not Guess Work

This preliminary analysis, with its time allotments, may, by no means, be a purely arbitrary arrangement determined by memory and guess work. To be worth anything it must offer a set of computations based on recorded experience and modified by judgment of particular conditions governing the specific operation. In our case, the time or progress chart is prepared by the general superintendent, in consultation with the various department heads of the company. When completed and delivered to the job superintendent, this chart becomes his orders from headquarters. Each week, during the construction period, he is required to fill out a copy to date and forward it to the home office. At the end of any operation, therefore, as many of these progress charts will have been filed as there were weeks consumed in building.*

It is, from the outset, a foregone certainty that the time schedules as posted will not, in all instances, be fully met in operations. The hazards involved in any complex undertaking are far too numerous to admit the hope, much more the expectation, of completely escaping them. Yet to each scheduled process is allotted no more than ideal appropriation of time. Whatever time allowance is reserved for emergencies is shown in the period established between the date of completion called for in the schedule and the date of delivery promised the owner. Separating these two dates, a gap of some days is generally figured.

The illustrative diagrams (figures 1 and 2) show clearly how our progress charts are prepared, how they are filled out, and what conditions of progress or retrogression they may indicate. While, for various reasons, not absolutely literal transcripts from charts actually used, their records may be accepted as thoroughly typical. The first is from the fourteenth week of an operation, the second from the twenty-first week. In offering evidence of human mutability, as well as of inanimate depravity, they equally offer evidence of human power to gain the upper hand of unfavorable circumstance.

Very little further discussion of their details seems called for. It will be observed in figure 1 that, at the close of the fourteenth week of work, nine out of the twenty-five processes constituting the building operation have been fully completed; eight more are under way; and eight are still unattacked, though for some days past scheduled on the chart.

Any one who has tried to hasten the movements of a recalcitrant steam shovel will readily understand what went wrong with the first process. A steam shovel is a monster which may be neither cajoled nor lightly replaced. If its unexpectedly developed troubles are curable, they are best remedied patiently on the spot. This may delay some subsequent items. The chart will enable accurate appraisal of the extent of this delay and of the rearrangments necessary to prevent the coming of labor crews before a place is ready for them.

With the fifth item the work seems to have found its stride. The important fundamentals of number 6 are, likewise, satisfactory, showing, as they do, an almost military precision of accomplishment.

With number 7, however, the march of perfection halts. The scheduled process is a short-time one. April weather has behaved true to form. There is not enough at stake to justify expensively heroic methods of wooing a reluctant spring. Delay is here accepted, just as it is in the case of number 12 and of number 17, which last is allowed to wait, pending the natural thawing of an accumulation of ice on the concrete roof-slab.

But there is real trouble brewing behind the curtain walls of number 8. Its time allowance is four-fifths consumed; the work is not half completed: Setting windows is in similar case. A freight breakdown, meanwhile, has stranded the window glass at some point of uncertain location. The owners likewise have made several shifts in the designs for their building.

Here are sufficient complications to occupy the time and attention of a number of experienced men. If the change of building design were extensive, it would entail the preparation of a new chart. But it is only sufficient to disturb existing schedules without disrupting them. Readjustment appears mainly in the equipment schedules, where elevators (20), plumbing (21), and electrical work are speeded up to compensate, if possible, for delay with the heating (22) and the sprinklers (23). But, though begun ahead of schedule, these processes give promise of holding on for the full count of time.

Such is the state of affairs at the end of the fourteenth week. What it is at the end of the twenty-first week appears in the succeeding diagram. In spite of some unfavorable indications on the chart of seven weeks earlier, the total operation is now very little behind schedule. The owners, however, are completely protected. The bull's eye at the extreme right of the chart—opposite item number 26—indicates what is the agreed date for turning over the building to them. That date is still two weeks distant. During those two weeks various odds-and ends of work connected mainly with the installation of permanent equipment will be finished and out of the way.

What the Chart Accomplishes

In spite, therefore, of outward delays and inward shifts of arrangement, the chart, originally prepared with some allowances for the capabilities of the unexpected, has served excellently its purpose. This purpose was to direct procedure, to record time already consumed, and to indicate the probable finishing date of each process. Accomplishing these enabled management to strengthen points of weakness as they developed, to concentrate effort on pivotal processes when occasion demanded, and, by keeping at all times clearly in vision the relation of each part to the whole undertaking, so to control the progress of events as to accomplish a satisfactory outcome within the time limit set.

But it is, or should be, clear that a progress chart will not produce its results automatically or unaided. It is less spectacular in its warnings than is a labor-cost chart (Contract Record of Oct. 10, page 962). Perhaps for that very reason it demands closer and more vigilant scrutiny by management, and calls for a finer exercise of judgment in determining precisely what action should be taken when unfavorable indications are encountered. The fundamental requirement that the chart schedules be carefully and intelligently prepared has already been stressed.

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*Such progress charts, with their careful record of experience with conditions as they must be met, supply the data upon which subsequent time-estimates are based. Conditions are, of course, never twice alike; hence the necessity for exercising judgment in first preparing a time schedule and later in appraising the seriousness of the causes which compel departure from it.

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Breaking Faith with Civic Tenderers

The Toronto city council recently solicited tenders for the supply of a quantity of water pipe. When the tenders were opened it was found that the lowest figure had been submitted by a firm that did not manufacture locally. The final result, however, was that a Toronto firm was awarded the contract at a higher figure. This is a bald statement of a somewhat long drawn out fight.

We have no criticism whatever to offer of the local firm that won. They presumably did what any good business firm would do—left no stone unturned that would help them to get the contract. The point at issue has nothing to do with who will supply the pipes. The real question is—was the Toronto city council honest? Is there not, after all, in business, such a thing as keeping faith? Are all municipal council agreements merely scraps of paper?

Calling for general tenders is open to only one interpretation—every tender will be considered on the same basis. This meaning is as clear and definitely understood as if it were actually stated in so many words. The consideration of the tender offered by the outside firm was a further acknowledgement of this obligation. There is little doubt that the original intentions of the Toronto city council were to treat all alike, just as there is no doubt that the final act of council was due to losing sight of a basic principle. It is the kind of action that demonstrates the lack of ideals. It may not be an offence against the law, but it is an offence that lowers the city of Toronto in the eyes of other cities. It makes it impossible for the citizens of Toronto to be proud of the fact that they are citizens, and inasmuch as a large city like Toronto may well be taken as an example to guide the actions of smaller municipalities, such action must have the effect of lowering the moral standard of citizenship from one end of Canada to the other.

The Contract Record wants to be clearly understood as to its stand in this matter. We are pleased to see business go to the firm that was finally awarded the contract; we appreciate the strength of the arguments regarding local unemployment; we do not over-rate the claim that such a course will prevent outside firms from tendering in the future; but we are clear on this point—**whatever an individual or a group of men agree to do, they must do.** If outside tenders are not to be considered—say so. If a certain degree of preference will be allowed local firms—say so; but if we are men, if we want others to think us manly, we must play the part. The Toronto city council's action is such that it will cause regret to every fair-minded citizen.

Technical Schools Help Apprenticeship

An item which appeared some time ago, in a Buffalo, N. Y., newspaper indicates convincingly the manner in which the desires of contractors may be so linked in the public mind with the aims of trade schools as to present a clear picture of the movement to improve the labor situation within the construction industry and thus bring benefit to all who undertake building operations, even down to construction of the smallest home. The article follows.

> Prominent contractors and builders of this city, as well as the Allied Building Trades Council and others, have endorsed the new courses in bricklaying, plastering and plumbing at McKinley vocational school.
>
> The following prominent Buffalo business men praise the courses and say they are willing to employ those who graduate as advanced apprentices in their respective establishments.
>
> J. H. Cowper, president of the John W. Cowper Construction Co., Inc., has the following to say in the matter:
>
> "I am glad to learn that it has been definitely decided to establish trade courses in bricklaying, plastering and plumbing at McKinley vocational school, and thoroughly endorse your idea and want you to know that I should be glad to help the furtherance of this in any way I can.
>
> "As far as I am able to do I should be glad to give the boys who graduated from this school in these courses employment as advanced apprentices and rate them accordingly. I will also endeavor to arrange to give them during their school term certain hours of work in the trade, in order that they may learn in a practical way more what they are after.
>
> "I am sure that this move will be endorsed and commended by all who are sufficiently familiar with what you are doing and of the prospect of having a number of boys not only given a good mental education, but adding to this

a practical trade in which there is a great demand at very high wages for capable mechanics."

It looks as if Buffalo contractors are doing their part to encourage apprentice training. Contractors in other cities, in Canada particularly, are in sympathy with any movement that will increase the number of mechanics in the building trades and we know that they would express themselves in terms similar to those of Mr. Cowper, if courses were established in our own technical schools.

Experiments with Activated Sludge

Six Months' Operation of Test Plant at Hertford, Eng., Provides Valuable Data Regarding Aerating Action and Sludge Content

At a meeting of the Association of Managers of Sewage Disposal Works, a British organization, held in London during the past month, some interesting information was given in one of the papers with regard to an activated sludge sewage disposal plant at Hertford, on which considerable experimental work has been carried out. The data was presented by C. E. Duckworth:

The plant consists of three G.I.W. tanks, each divided into two compartments by a partition in the centre longitudinally, thus forming a series of six narrow tanks or channels 4 ft. 1½ in. long by 1 ft. 7 in. wide by 2 ft. 9 in. depth of liquid. Each channel was fitted with two air diffusers placed at the bottom against the partition. The channels were connected in sequence by short lengths of 2 in. internal diameter G.W.I. pipes, which were placed immediately over the ends of the diffusers, so that the liquid, in passing from one channel to the next, could not do so without coming into contact with the air from the diffusers.

The combined capacity of the channels was about 670 gallons. These channels comprise the aeration part of the plant, in which the sewage mixed with the returned sludge is thoroughly agitated by means of air supplied from a rotary blower.

The last or sixth channel was connected to a square tank 3 ft. by 3 ft. by 1 ft. 1¼ in. depth to the top of the pyramidical bottom, the pyramid being 1 ft. 8 in. deep. The liquid passes through a 1½ in. G. W.I. pipe, which discharges it at the centre of the tank by means of a special device to prevent the disturbance of the liquid and settled matter in the tank. This form of inlet gives the liquid a downward tendency, with a low velocity which facilitates the settlement of the finely-divided suspended matter. The capacity of this tank is about 94 gallons, and it serves the purpose of a settlement or humus tank. It might be noted here that this settlement tank, with the greater volume treated by the aeration tank, proved too small for the remainder of the plant, and should be at least twice as large.

The clear liquid or effluent leaves the tank by means of a triangular notch cut in the side of the tank. A certain amount of roping was noticed, owing to there being only one outlet; a continuous weir would have been better.

The settled sludge is conveyed by means of a 1 in. G.W.I. pipe taken from the invert of the pyramidical tank, and the quantity required is discharged into the first of the series of aeration channels near the inlet for the sewage by means of a small automatic air lift, which was operated by air taken from the aeration air supply. The excess sludge is drawn off from the sludge return pipe by means of a valve near its base.

The incoming sewage is pumped from a tank fixed at such a level as to receive sewage from the sewer at the sewage works before it reaches the existing lime and chemical mixing chamber. A fine screen is fixed around the inlet to the supply pipe in the sewer to prevent any large flocculent matter entering the same. The sewage is pumped into a small hopper, from which a 2 in. G.W.I. pipe leads into channel No. 1 near the surface, and in such a position that it flows directly under the discharge from the air lift.

Pumping and Blowing Equipment

The pump and rotary blower are operated by a small petroleum engine. The great difficulty with such an exceptionally small plant as this is that a sufficiently small engine, blower and pump and suitable for running twenty-four hours a day week in and week out, could not be obtained, and the circumstances the number of stoppages due to temporary failure were remarkably few. The engine was a Petter semi-portable and was rated at 2½-b.h.p., but the actual power required by the pump and blower was estimated at less than 1-b.h.p.

The pump was of the "Ritt-Plunge" type and discharged about 5 gallons per minute. Such portion of the discharge as was not required to be delivered to the aeration tanks was by-passed and run to waste.

The blower was of the Reavell's rolling drum type, and rated to deliver about 30 c.f. of free air at 2,000 r.p.m. Running at about 1,350 r.p.m. the loss due to "slip"—i.e., leakage past the blades—is very high, and the volume of air actually discharged to tanks was 10 c.f., of which about 1 c.f. was taken by the sludge air lift, leaving 9 c.f. for the aeration tanks. It will be seen later that this worked out at about 3 c.f. of air per gallon treated, which agrees very closely with the amount found to be necessary for such small and shallow tanks where the time of contact between bubbles and liquid is of necessity very short.

These three units were really only suitable for running a few hours each day, but were the best that could be obtained for the purpose.

Particulars of Time Worked by Plant

The plant was started on April 13, 1922, at 11.30 a.m., and was worked for 5½ hours, after which it was stopped on account of Easter holidays. The plant was restarted on April 18th at 12 noon, and was worked intermittently until May 11th, usually from about 7 a.m. until about 10 p.m. The total number of hours the plant was worked during that time was 317. From May 11th the plant was run continuously, but owing to trouble with the engine this was not possible until after the 15th of the same month. After this trouble the plant was worked continuously, with the exception of one or two days, when trouble was experienced with the engine, and also when it was necessary to de-carbonize, until 10 a.m. on August 12th, when the blower gave out. The time the plant was working up to this date from the commencement was 2,420 hours, or 2,103 hours practically continuously. The blower was sent away for repairs, returned and refixed, and started again at 8 a.m. on September 14th, and run continuously as before until 9 a.m. on January 15, 1923, when the centre tank was removed—i.e., Nos. 2 and 5 channels removed—thereby reducing the capacity to two-thirds of the original —i.e., about 447 gallons.

The time that the plant had been worked up to this date from the commencement was 5,085 hours, of which 4,668 hours were practically continuous, except when stopped for repair of blower, &c.

The purpose for the remainder of the experiment was to ascertain the smallest length of aeration required for treating the Hertford sewage, which is a very weak sewage owing to being diluted with infiltration of ground water into the sewers, the dilution being about three times the calculated D.W.F. of the population served by the works.

Before the centre tank was removed the liquid and sludge in the aeration channels was run off into a large tank, and when the alterations were completed this was pumped back. The plant was started up again at 3 p.m. on January 15th, when some trouble was experienced with the engine. After repairing the engine the plant was only run for a few hours a day to keep the liquid fresh, as it was decided to stop experimenting because sufficient information had been obtained. The time the plant was working during the latter experiment was 1,421 hours.

Samples were taken periodically of the raw sewage, liquid in No. 6 channel, activated sludge from air lift, and the final effluent, and sent for analysis the results of which are given separately.

Results of Operation of Plant

When the plant was started on April 13th. 1922, the speed of the engine was 700 r.p.m., the blower 1,350 r.p.m., and the pumps 569 r.p.m., and these speeds were maintained as far as practicable during the experiments.

The method of working after the plant was restarted on April 18, 1922, was as laid down in the instructions issued by the makers of the plant—vis., Messrs. Activated Sludge, Limited, of Westminster.

(1) **The building-up Stage.**—The maximum volume the pumps could discharge was passed through the tanks continuously for as many hours as the engine was run. The air lift was regulated to return a volume equal to about half the volume delivered by the pump. This was continued until a sample of the liquid in No. 6 channel in a glass cylinder, after standing for one hour showed a sludge content of 10 per cent of the volumetric contents of the glass cylinder.

At 11 a.m. on—
27.4.22, after running 120 hours, sludge registered 2 per cent
1.5.22 " " 174¾ " " " 1½ "
At 3.30 p.m. on—
5.5.22 " " 236¼ " " " 6 "
At 10 a m. on—
9.5.22 " " 287¼ " " " 10 "

At 11 a.m. an 11.5.22 the pump was stopped, but plant continued with aeration only in accordance with instructions, which were as follows:—

(2) **Aeration of Tank Liquid.**—When the 10 per cent of sludge has been obtained the pump discharge should be stopped, but the air lift should be operated at full capacity. The aeration should be maintained continuously day and night until a sample taken from the settlement tank shows traces of nitrification on test with Greiss Illosvay solution "A" and "B," or effluent on test shows only traces of ammonia.

The test for nitrification:—To 50 c.c. of effluent add 1 c.c. of Griess Illosvay Solution "A" and 1 c.c. of Griess Illosvay Solution "B." Allow to stand for 10 to 15 minutes. A pink coloration shows nitrification is taking place.

The results were as follows:—

At 11 a.m. on 11 5.22, when the plant had been working 320½ hours, the aeration period commenced.

At 3. p m. on 11.5.22, after areating for four hours, the sludge registered 16 per cent.

At 11 a.m. on 17.5 22, after areating for eighty and a half hours, the sludge registered 19 per cent, and remained 19 per cent until 11 a.m. on 21.5.22, when it registered 20 per cent.

At 11 a.m. on—
21.5 22, after aerating for 193¾ hours, sludge registered 20%
22.5 22, " " " 217¾ " " " 21 "
23.5.22, " " " 236 " " " 22 "
24.5 22, " " " 256¼ " " " 23 "
25.5.22, " " " 278¼ " " " 24 "
26.5 22, " " " 302 " " " 23 "
27.5.22, " " " 326 " " " 25 "
29.5 22, " " " 371 " " " 25 "
31.5.22, " " " 437 " " " 25 "
1.6 22, " " " 461 " " " 24 "
2.6.22, " " " 485 " " " 22 "
3.6 22, " " " 509 " " " 23 "
4.6.22, " " " 533¼ " " " 23 "

On the 6.6.22 the test showed that nitrification was taking place, and at 4 p.m., after aerating for 286¼ hours, the pump was restarted.

During the period of aeration it had been found necessary, owing to evaporation (plant being in very exposed position), to occasionally add a small quantity of sewage.

At 4 p.m., 6.6 22, pump discharged ¼ gallon per minute, sludge returned at 1/8 gallon per minute.

Gal. Per Min.
At 9 a.m.—
7.6.22, after running 17 hrs. pump discharge increased to ½
At 3 p.m.—
7.6.22 " " 23 " " " " ¾
At 6 p.m.—
7.6.22 " " 26 " " " " 1
At 9 a m.—
8.6.22 " " 41 " " " " 1½
At 3 p.m.—
8 6.22 " " 47 " " " " 2½

and in all cases the volume of sludge returned by air lift was regulated to half the volume of discharge by pump. Also before an increase of sewage was made the test for nitrification was maintained.

The plant was worked at this until July 11th, when it was found on testing discharge that the sewage passing into No. 1 channel was 2 gallons per minute, and the returned sludge at 1 7/8 gallons per minute, this drop in pump discharge being properly due to the efficiency of the pump decreasing. The discharge was regulated to 2½ gallons per minute and plant continued working as before until July 24th, when the discharge from pumps was increased to 3 gallons per minute and the returned sludge by air lift to half that volume. This was continued until the blower gave out on August 12, 1922.

When the plant was restarted at 8 a.m. on September 14th the liquid in the aeration channels and settlement tank was agitated and the air lift worked at full capacity until on testing for nitrification it was obtained at 3 p.m. on the same day. As it was found at 3.45 p.m. to be strong, at 4 p.m. the sewage was passed into the channels at the rate of 7/8 gallon per minute and the air lift regulated to 5-9th gallon per minute. This was continued, and at 10.30 p.m. the nitrification on test was strong. Owing to the sewage supply failing during the night of September 14th-15th, the liquid was agitated until 10 a.m., when the volume was increased gradually to 3 gallons per minute at 4 p.m. on the same day. At 7 p.m. of the same date the percentage of sludge was 13 per cent, the nitrification was strong, but the effluent was cloudy.

At 11 a.m.—
16.9.22, sludge 13 per cent nitrification weak, effluent cloudy
17.9.22, sludge 13 per cent nitrification good, effluent cloudy
18.9.22, sludge 14 per cent nitrification good, effluent clear

and continued so onwards, the percentage of sludge being kept at from 10 to 15 per cent.

The discharge of sewage was continued at 3 gallons per minute until October 21st. when it was increased to 4 gallons per minute and the air lift regulated to 2 gallons per minute, the percentage of sludge being 16 per cent, nitrification good, and effluent clear. When working at this rate of discharge it was found that the percentage of sludge gradually decreased, until on October 28th it was 11 per cent, although the nitrification was good and the effluent clear. From this time the percentage of sludge decreased very rapidly, until on the 31st the percentage was only 3 per cent nitrification good and effluent cloudy.

Owing to this loss of sludge the discharge of sewage was decreased to 3 gallons per minute at 4 p.m. on October 31st, and the air lift regulated to 1½ gallons per minute, and it was found that the sludge built up fairly rapidly, nitrification remained good and the effluent became fairly clear on November 2nd and clear on the 4th, until on the 8th the sludge was 14 per cent nitrification good and effluent clear.

It should be noted here that when this model plant was designed the makers anticipated that the rate of flow of sewage which the aeration tanks would treat was 2 g.p.m., and the settlement tank was designed for this quantity, plus its proportion of returned sludge—that is to say, a period of stay in the aeration tanks of about 3 3/4 hours and in the settlement tank of half an hour.

From the foregoing it will be seen that actually 3 gallons of sewage per minute were effectively treated, giving a period of stay in the aeration tank of 2 1/2 hours and in the settlement tank of 21 minutes. It was evident that had the settlement tank been larger the plant would satisfactorily have treated 4 g.p.m., or twice the anticipated quantity.

Experiments with Tannery Waste

As the sewage of Hertford contained tannery waste experiments were carried out to see the effect this would have upon the plant.

On November 8th, at which time the percentage of sludge was 14 per cent nitrification good and effluent clear, two carboys (20 gallons) of liquor (white) were obtained and placed in the suction tank, at 3.10 p.m. the dilution being about 1 to 24. The effluent became cloudy at 6 p.m. At 10 a.m. on the 9th the percentage of sludge was reduced to 8 per cent nitrification good and effluent clear.

On the same day (9th) two more carboys (20 gallons) of liquor (white) were obtained, and the contents of one carboy (10 gallons) was placed in the suction tank at 10.30 a.m., the dilution being about 1 to 49. The effluent became cloudy at 3.10 p.m. At 11 a.m. on the 10th the percentage of sludge was 3 per cent nitrification and effluent cloudy.

It was found that during the day the connection between the channels 1, 2, 6 and settlement tank became partially blocked at different times, thereby causing a loss of sludge owing to washing over sides of channels, with the result that at 11 a.m. on November 11th the percentage of sludge was 2 per cent nitrification good and effluent clear. The sludge built up rapidly, until on the 14th it was 11 per cent, on the 15th 14 per cent, and on the 16th 16 per cent, with nitrification good and effluent clear in each case.

The plant continued to work as before until January 15, 1923, when the capacity of the aeration tank was reduced to two-thirds—viz., 447 gallons.

After taking out the middle tank on January 15, 1923, the plant was re-started at 3 p.m. by pumping back the liquid previously run off into the suction tank, and the discharge into the aeration channels was started with a small quantity and gradually increased until it was 2 1/2 gallons per minute on the 17th, with the sludge returned by air lift regulated to 1 3/4 gallons per minute. This discharge was maintained until January 22, when the engine gave trouble, and it was found that renewals were required. The plant was re-started at 3 p.m. on the 26th, and liquid in channels, &c., aerated for three hours, and at 6 p.m. it was found that nitrification was good and the discharge of sewage was started at the quantities stated above. The plant continued to work until March 23rd, when the experiments were stopped.

During the working of the latter experiment it was found that the plant (except settlement tank, which was still too small) was quite capable of dealing satisfactorily with the quantity passed through.

Schedule Showing Time Plant Worked to the Taking of Each Sample

(The times are taken from the time that nitrification was present in all cases).

No. of sample	Date	Quantity of Sewage (gals. per min.)	Quantity of sludge returned (gals. per min.)	Percentage of sludge	Nitrification	Effluent	No. of hours Worked
1st set	8.7.22			14	fair		632½
2nd set	11.7.22	2 1/7th	1/78	10	good		824½
3rd set	26.7.22	3	2 1/7th	17	good	clear	1,181½
4th set	11,8.22			17	good	clear	1,526
5th set	26,9.22			15	good	clear	·282
6th set	11.10.22	2½	1 1/4	16	good	clear	610½
7th set	27.10 22	4	2	12	good	clear	983½
8th set	15.1.23			18	good	clear	2,825
Samples for reduced capacity of aeration channels							
9th set	27.2.23	2½	1¼	13	good	clear	860
10th set	15,3.23	2½	1¼	13	good	clear	1,241½

*Plant worked twenty-four hours after this, until blower gave out on 12.8.22.

Schedule of time of stay in aeration channels and settlement tank for varying rate of sewage discharge

Sewage gals. per minute	Returned sludge (gals per min.)	Length of stay in aeration channels	Length of stay in settlement tanks
		H.M.	H.M.
2	1	3.43	0.31 1/3
3	1½	2.27	0.21
4	2	1.52	0.15 2/3
For reduced capacity of aeration tanks—447 gallons			
2½	1¼	2.0	0.25

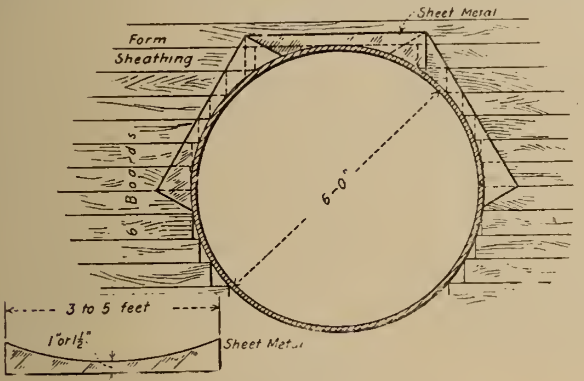
Hints for the Contractor

Fitting Formwork Around Tanks

Today when form costs run high even at best, any method which will save time and labor is well worth considering.

In a job involving the installation of two large water supply tanks of steel, H. W. Eldridge, an engineer and contractor of New York, N. Y., developed a useful way of fitting the formwork around the tanks, which is described in "Contractor's Atlas."

The two tanks were each 30 ft. long and 6 ft. in diameter, supported at each end by concrete walls. In order to make a neat job of the framework so that the concrete would have a good appearance, it would have been necessary to spend considerable time cutting and fitting the boards to the circle of the tank—in fact, to do a very good job would have meant cutting the ends on a band saw. To do away with the fitting operation, sheet iron plates cut to the proper radius were used to make a tight fit around the tank. These pieces each forming part of the required circle were cut from scrap pieces of black iron of about 18 gauge by the local sheet metal worker. The form boards were cut with square ends, nailed to the studs in such a manner that the space between the square end of the form board and the outside of the tank was not over 2 in. The sheet iron pieces were tacked to the inside of the form. The sheet iron pieces were of varying lengths, depending on the scrap available. The only fixed dimension in the piece of sheet metal is the proper radius and the provision of at least 2 in. at the narrowest portion. This method resulted in a saving of $4.00 per cu. yd. of completed concrete on this portion of the work.



How slab forms were fitted to circle

Advantages of Aftercooling Compressed Air

By F. A. MacLEAN

Under most conditions atmospheric air contains more or less moisture. When this air is compressed and cooled much of this moisture is precipitated with a resulting shrinkage in volume and the loss of the power consumed in compressing the vapor. This condensation process takes place in ordinary pipe lines as used around plants, because of the radiation of heat to the atmosphere.

It is a well known fact that moisture in air pipe lines ultimately reaches the drills or tools. This moisture has two detrimental effects. First, it washes away the lubricating oil causing excessive wear in the drills with the high maintenance charges. The second trouble is that due to the low temperature caused by expansion of the air in the tool, this moisture freezes in the valves, ports, etc., greatly interfering with the operation of the drill or tool.

Production is retarded if not stopped altogether by this accumulation of ice. It has been found from experience that it pays to keep pneumatic equipment working at full capacity as much of the time as possible, even though it may require additional outlay for equipment and power to do so. In most compressed air plants where the air is used for operating rock drills or pneumatic tools it, therefore, pays to eliminate the troubles caused by moisture.

Two methods are available; one to take into the compressor dry air only and use it at the tools with as little loss of heat as possible. This is the ideal solution, but physically impossible. The second method is to remove as much moisture as possible from the air after it has peen compressed, and before it is used in the tools. This can be most readily done by means of an aftercooler which simply reduces the temperature of the air compression and precipitates the major part of the moisture.

Due to the reduction in temperature caused by cooling the air, there is also a reduction in volume. This means that a smaller volume has to be transmitted through the pipe line which in turn means a lesser pressure drop, or a saving in power. This saving in power partially affects the loss in internal energy caused by the reduction in temperature during the process of cooling.

In addition to the foregoing advantages for the use of an after-cooler, there is another which is worth consideration and that is, less expansion of the pipe lines due to the uniform and low temperature of the air entering same. Still another advantage is the precipitation of lubricating oil at a point where it can be easily drained from the system, reducing the rotting of rubber gaskets and hose if used. The advantages may be summed up as follows:

(1) Elimination of freezing troubles.
(2) Less wear on drills or tools.
(3) More production from men and tools.
(4) Less pressure drop in lines which means more work for the same power expended in compressing the air.
(5) Elimination of expansion strains in pipe lines.
(6) Removal of oil from air.

British Cement Industry Not Controlled by U. S. Capital

A few weeks ago it was reported that the controlling interest in the Associated Portland Cement Manufacturers, Ltd., which controls capital to the amount of £13,000,000, and nearly 90 per cent. of the

British cement industry, has passed to a newly registered company called the Associated Anglo-Atlantic Corporation, whose chairman is Sir Philip Nash. It was said that this indicated that U. S. capital would dominate the British Cement industry. This is now denied by Brig.-General Stanley, chairman of the Associated Portland Cement Manufacturers, who has returned from a visit to the company's works in British Columbia. He says: "I definitely state that references to American control or management are entirely untrue and I have the authority of the chairman of the board of the Associated Anglo-Atlantic Corporation that their company is an entirely British concern. Sir Philip Nash, chairman of the board of the Associated Anglo-Atlantic Corporation, has requested me to say we are working in friendly co-operation."

Quarry-Run Stone for Exterior Walls

The erection in the past two or three years of numerous college, institutional and church buildings in which the dominant architectural feature has been carried out through the use of rough sawed, quarry-run Indiana limestone for the random ashlar field work of exterior walls has served to heighten the interest of the public in this form of stone work, states a recent article in "Stone." The resultant effect obtained in this random ashlar treatment of walls is especially pleasing where the surroundings of trees, lawns and driveways is possible and for this reason it has unusual possibilities in residential construction, especially where the plot is of sufficient size to admit of landscaping. Quarry producers find that architects are very much interested in both the effects and the economy of this class of masonry work and that they are using it in an ever increasing number of buildings, and especially in those districts where masons are available to set the stone.

Random ashlar, as the name implies, means that the joints are irregular—that the strips of rough sawed, four-sided material, as furnished by the quarry producer, are broken off irregularly to the lengths required on the job. Such a wall facing is essentially a mason's job and should be treated as such, rather than as cut stone trim. While in the larger structures such as college buildings and churches, cut stone trim is almost essential, it can be employed without trim in small houses of moderate cost. The economy in the use of quarry-run stone lies in the fact that no stock is discarded for blemishes that do not constitute structural defects. This, of course, enables the producers to fill orders without regard to selection for color, texture or length of blocks, a process that adds much to producing costs.

Freedom of use is the chief attraction of this quarry-run stock. It enables the architect to work out an idea of solidity with a maximum textural effect and with a full range of color. In the matter of trim the designer is enabled to turn simplicity into dignity through the concentration of cut stone trim at entrances, on towers and around windows. These are focal points and frequently are overlooked as means of promoting handsome decorative effects. Quarry-run stock, then, may be said to bridge the gap that has long existed between cut stone and the rougher field stone masonry, although it is inclined to follow the latter in methods of setting and is best handled by masons acquainted and accustomed to broken joints and varying widths of raked out mortar joints. These mortar joints range in width from three-fourths to more than an inch, dependent upon the architect's specifications. Being sawed for size the stone is delivered to the job in much more accessible shape than is the usual run of field stone and for this reason its development has been to replace rough textured brick and hand dressed stone.

The Week's Developments in a Nutshell

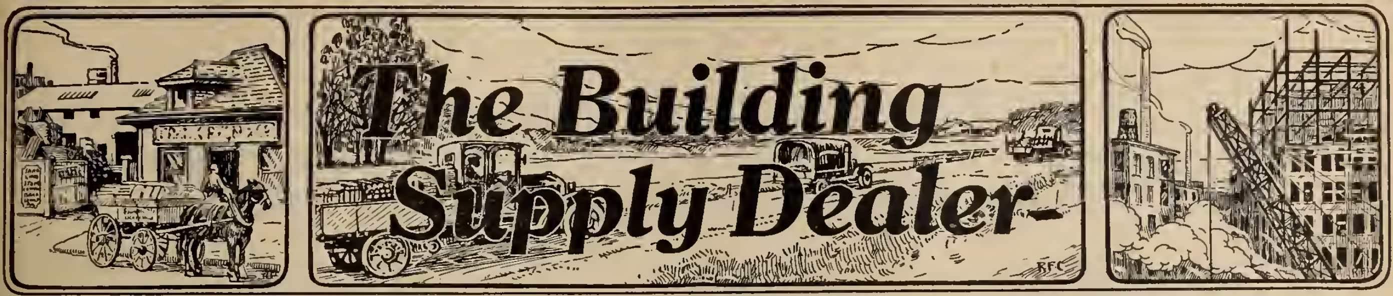
Roger W. Babson, the U.S. statistician, has lectured during the past week in both Montreal and Toronto. He is neither optimistic nor pessimistic. In that he is in accord with Professor Michell whose most recent curves show a decided tendency to oscillate within very narrow limits. The outlook for 1924 according to both these students of economics may be said to be a repetition of 1923.

Mr. Babson admits that many industrial and financial authorities in his country do not agree with him—they are much more optimistic. This refers particularly to the steel industry where the 1923 operations have been considerably better than was expected (in Canada, almost double the figures of 1922) and where anticipations are freely made that next year will see further improvements.

Further to this, sentiment as regards the banking situation is much improved. All the annual statements coming through are demonstrating the sound positions of the banks and the public is now apparently convinced there will be no further troubles in that quarter.

A decidedly favorable factor in the future outlook is the more liberal policy of the Dominion government regarding immigration. In his address Babson emphasized the uselessness of natural resources without the necessary man power to develop them. The Minister of Immigration and Colonization, Hon. Mr. Robb, states that the regulations regarding immigrants have not been so lenient for many years as they are now.

The labor and material situation remains almost unchanged. Iron and steel prices have stiffened again slightly but this is about offset by small recessions in two or three lumber lines. Open weather has kept labor well employed. Retailers are very optimistic for Christmas trade and, in general are making plans for a December business about twenty-five to thirty per cent in excess of last year. A retail shoe house states that November turnover was twenty-five per cent better than November, 1922, and a large electrical firm's business for the first ten months is forty per cent ahead of the same period a year ago.



Knowing His Costs is the Dealer's Salvation

The Supply Man Who Guesses at Costs is a Detriment to the Business—Success Demands Knowledge

By EDWARD K. CORMACK*

If it required any one fact to demonstrate that man is still a long ways from being the thinking animal he calls himself and therefore entitled to be classed as an intelligent being, it is his attitude towards what are termed costs.

Cost may briefly be defined as what you have to pay for anything, real or unreal, tangible or intangible. A man cannot ignore the natural law governing his physical life without having to pay and what he pays is the cost of that particular pleasure, and I can understand a man taking a chance on this kind of debt, in the hope that it will not be heavy, better than I can understand the ignoring of what might be called "mathematical costs" in the consideration of which there is no gamble and no doubt, when even the Supreme Architect (and this is said with all reverence) cannot escape from being compelled to give consideration of and adherence to the working of all laws governing mathematical costs.

Dangerous Fools That Rob All Business

Of all the fools allowed to run around loose on this earth, the prize boob is the so-called business man who guesses at his costs, and this particular kind of fool is not a harmless half-wit; he is a real and dangerous maniac because, in his ignorance and disregard of all the fundamentals entering into the great subject of cost, he makes it impossible for his competitor who has a true understanding of the subject to exist, and in this respect the fool referred to is dangerous to the community, and some day the state will realize that it has the same moral and legal right to put him under restraint as it would have did it catch him running up and down the street with a knife in his hand, slaying all he came in contact with.

If the individual's managing and selling methods are not efficient, are not what they ought to be and could be, no amount of co-operation with his fellow business men is going to make his business profitable.

The only excuse for going into business is to make money. The money thus made is profit and profit is the difference between raw cost plus manufacturing, delivering and executive expense, and the amount received for the completed article or service.

Did I hear a voice from the rear say, "Any fool knows that"? My dear sir, you are wrong, for I know many fools, big and little, in the supply business who do not know it.

These gentry are not cost finders—they are guessers, and poor guessers at that! They price the value of their goods and service at an arbitrary figure largely based upon what their competitors are doing. The blind leading the blind.

When Edward N. Hurley was chairman of the U. S. Federal Trade Commission he preached incessantly, "Know your costs." At that time I wondered why he harped so much on the one text. Now I know. The evidence of the drunken indifference of the business man to this all-important factor of profit safety was daily laid on his desk in such staggering magnitude and the effects so appalling that he could not do other than cry out, "Know your costs."

Since I have been business counselor for the National Builders' Supply Association I am beginning to feel a good deal like Mr. Hurley did.

I wish I could, without breach of confidence, tell of some of the letters daily being received in reference to the troubles of the building supply industry.

They come from large as well as small cities, from men nationally known in the industry and from men I have never heard of. Without exception, they all carry the same tale of woe, on the principle, I suppose, that only those sick consult the doctor. It has ceased to be a joke. It is a tragedy, so much so that the head of one of the largest firms in the country winds up his letter by asking, "Is there any place in the scheme of things for the building supply dealer?"

Putting the Dealer Question Up to Einstein

I suppose it's the simplicity of the thing that makes it so hard to put over. The dealer wants to be saved, he can be saved, but he won't permit himself to be saved. Puzzle it out; it's a problem worthy of Einstein.

Now I don't care what kind of cost system you use any more than I care what make of compass a vessel has on board. My only concern is that it be accurate.

Some time ago I was in the office of a dealer and this question of costs came up. He said he could sell and deliver a certain commodity for fifty cents per unit. I knew he couldn't and said so. We argued and finally agreed that for a period of one month the actual delivery charges on this particular commodity should be the subject of special attention and record. At the end of the period I received from him a statement showing the delivery charges **alone** were seventy-four and four-tenths cents per unit and this did not include warehousing, selling and executive expense.

It's enough to make angels weep.

Floundering, blundering, snarling, fighting, blam-

(Continued on page 1167)

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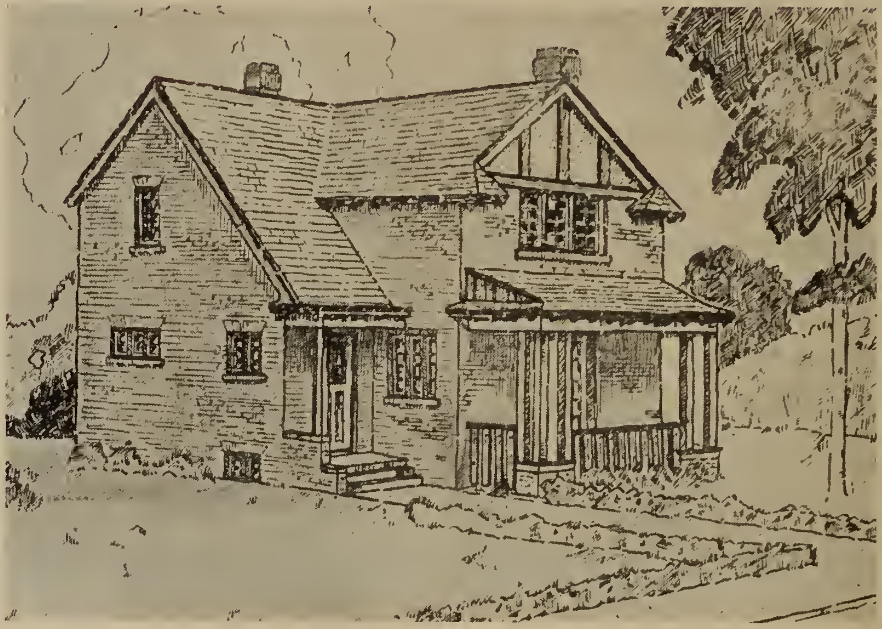
*Business Counsellor, National Builders' Supply Association, in "Building Supply News."

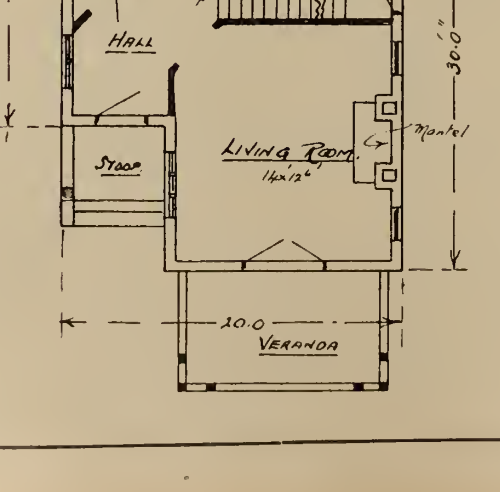
The Contract Record's
Weekly House Suggestion No. 91

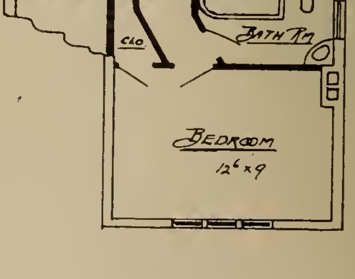


This design is representative of a number of small, detached, 6-room residences being erected by Duncan Munro, on the Gartshore Estate, North Toronto. The houses are all detached and are laid out two on a 52 ft. lot, with a central drive. The plans shown are used in all the houses, but the exterior is varied in each case. The first floor layout is so arranged as to keep hall and stair space down to the minimum. There is a nice sized living room, equipped with mantel and opening on an enclosed verandah at the front. The kitchen has entrances from the side and from rear. The floors are of hardwood, as is the trim in the hall, living room and dining room.

There are three bedrooms and bathroom upstairs, trimmed in pine, white enamelled. The flooring here is of hardwood also. The houses are all wired for electric ranges, which will be installed by the builders. The heating system is of the hot air type.

Messrs. J. Hunt Stanford & Son, architects, Yonge St. Arcade, Toronto, are the designers of these houses.





Knowing Costs is the Dealer's Salvation

(Continued from page 1165)

ing others for woes resulting from the dealer's own careless neglect. Is there nothing that will shake his mind out of the torpid trance it is in, so he may take his rightful place among the useful and necessary industries of the country?

Will he not realize that the dangerous competition which saps the life blood of an industry results from a lack of knowledge of "costs?"

If you would acquire the A, B. C of successful cooperation, know, don't guess, your costs and assist your competitor to know his.

O. O. Lefebvre Talks on Storage Reservoirs

The Ottawa branch of the Engineering Institute of Canada was addressed on November 15 by O. O. Lefebvre, M.E.I.C., chief engineer of the Quebec Streams Commission on the subject "Storage Reservoirs in the Province of Quebec." He explained the method of constructing and operating storage reservoirs for power development and indicated how such projects are financed and how the rates are determined. The lecture was illustrated with lantern slides.

Mainly Constructional

East and West—From Coast to Coast

Mr. George Brigden, chairman of the Ontario Division of the Canadian Manufacturers' Association, in an address before the association at Toronto recently, urged that engineers and architects specify home products in the construction of buildings, which, he stated, were as good as any in the world.

Mr. D. W. McLachlan, engineer in charge of the proposed St. Lawrence ship canal, when addressing the annual dinner gathering of the Peterboro branch of the Engineering Institute of Canada recently, appealed for a united Canadian engineers' opinion to meet the united American opinion on the question of carrying through of the project with only one dam. This plan would not endanger the safety of the people of Montreal, he said.

On account of the frequent breaks in the watermains in Quebec City, it is proposed to appoint a board of engineers to investigate the condition of the entire system.

The Dominion Truck Equipment Co. Ltd., of Kitchener, Ont., have opened an office in Montreal, at 10 Victoria St., with R. V. Clark as their district representative. The Dominion Truck Equipment Co. manufacture trailers, hoists, dump bodies and truck units, and the increase of their business in the province of Quebec has made this step necessary.

Messrs. Pennington and Boyde, prominent Windsor architects, have completed the drawings for the new St. Peter's Seminary in London, which will cost about $500,000.

The design of a war memorial monument, prepared by Mr. Alfred Howell, director of art at the Central Technical School, Toronto, has been chosen by the city of Guelph. The monument will cost $25,000.

Plans have been completed and approved for a new building to be erected by the Ursuline Sisters on a 90-acre site adjoining the University of Western Ontario, at London, Ont., in which the work of Brescia Hall, a ladies' seminary affiliated with the University, will be continued. The plans call for a three-storey stone building of Gothic architecture to accord with the main university group. Tenders are to be called for at once and it is estimated that the cost of construction will be $250,000.

According to a recent announcement made by Colonel Thomas Vien, K.C., M.P., the construction of a roadway on the Quebec Bridge has been decided upon and only details regarding the contributions of the Federal and Provincial Governments remain to be settled by negotiations, which are already in progress.

The construction of fireproof vaults and buildings was discussed by W. A. Robertson, local engineer, before a recent luncheon meeting of the Hamilton Architects' Association, in the Royal Connaught hotel. He stressed the ever-increasing extent of fireproofing in modern building.

A recent report states that the Long Lac-Nakina cut-off, for the Canadian National Railways, was completed a few days ago. The work has been in progress for 11 months and has employed from 200 to 1,200 men continuously. A remarkable feature about this work was that not a single accident of a serious nature occurred.

An interesting piece of engineering work designed to improve navigation on the Yukon river is being done this year by the White Pass Transportation Company. The source of the river is a number of great lakes, fed from melting snows, that do not fill up until late summer, thereby causing low water in the river in spring and early summer months. At the foot of Marsh lake the company is constructing a great dam, the top of which will touch high-water mark. This will hold back water for use when it is needed and when the rivers of northern Yukon are in flood. It is expected by this means to cut out the annual spring navigation delays. The plan for the dam was investigated and approved by dominion government engineers.

During the season just closing, 51 miles of road were built in Renfrew County, Ontario, including grading 23¼ miles; surfaced with gravel 14 2/3 miles; surfaced with macadam 13 miles. In addition, there were built 69 culverts of varying sizes and a number of pipe culverts. The quantities for this were, approximately, excavation of rock and stone 138,000 cu. ft., gravel 26,415 cu. ft. and crushed stone 39,000 cu. ft. The usual amount of maintenance work was carried out and 31 3/5 miles of macadam road were surface treated with liquid asphalt.

Personal

Mr. J. Hubert Dougherty, Toronto Manager of the General Supply Company of Canada, Ltd., has been transferred to the management of the Montreal office. Mr. W. H. Qua will succeed Mr. Dougherty as manager of the Toronto office.

Mr. Richard W. Yerkes, formerly general manager of the Philadelphia plant of the Link-Belt Company, has been appointed to succeed Mr. B. A. Gayman as treasurer of the company. Mr. Yerkes will be located at the general offices of the company, at 910 South Michigan Ave., Chicago.

Messrs. Viau and Venne, architects, formerly at 76 St. Gabriel St., Montreal, have moved to 99 St. James St.

Trade Incorporations

A recent registration at Montreal is Dubreuil & Prezeau, to manufacture cement blocks.

Jackson Construction Co. Ltd., with head office at Winnipeg, capital $100,000, to carry on a general contracting and building business.

The Balsas Dredging Company, Ltd., with head office at Vancouver, B. C., capital $100,000.

Mollison Construction Co. Ltd., with head office at Winnipeg, Man., capital $30,000, to carry on a building and contracting business.

CONSTRUCTIONAL ACTIVITY

Period of November 28 to December 4, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Cloverdale, B. C.
Surrey Dyking Commission has decided to construct a ditch on west side of Clover Valley Road, 5 ft. by 1,500 ft. Tenders will shortly be called.

Logan Twp., Ont.
Tenders for the laying of 'Parrott' drain, will be received till December 14 by the township council. Brodhagen, through the clerk, Louis Geo. Rock, R. R. No. 1, Bornholm, Ont. 10% marked cheque required.

McKillip Twp., Ont.
Tenders are being received till December 14, by Jno. McNay, Clerk, township council, Seaforth, Ont., for laying of 2½ miles drain. Plans at lot 35, con. 3 McKillop Twp., Ont. A 10% marked cheque required.

Sturgeon Falls, Ont.
Work is expected to start next year on a new road from Sturgeon Falls to Cobalt, Ont.

CONTRACTS AWARDED

Coteau Station, Que.
St. Lawrence Water Co. have awarded the general contract for $10,000 aqueduct, to Jos. Denis, Coteau Station. Engineer in charge of work is Oscar Beaudoin, 232 Bord Du Lac, Point Claire, and is in the market for cast iron pipes, 6 in. or 8 in.

Montreal, Que.
F.Lapan, 601 Locardaire, has been awarded the contract for grading Sherbrooke St. E., extension, at $87,000 and is in market for 1 air compressor.

Metapidia, Que.
Work is in progress for gravel road to Cross Point, 12 miles long, J. Adams, Metapedia, Que., is the general contractor.

Oshawa, Ont.
The contract for pump and motor has been awarded by the Board of Water Commissioners to De Laval Co., Ltd , 43 Richmond East, Toronto.

Toronto, Ont.
The following firms have been awarded contracts for sewers by the city of Toronto; J. H. Knight Construction Co.; Murphy Contracting Co.; P. Licastro, 1423 Dufferin St.

Railroads, Bridges and Wharves

Chantry Island, Ont.
Plans are to be prepared for harbor improvements here, to cost $50,000.

Grand Mere, Que.
The erection of a wharf to cost $15,000 is proposed by the city council. Engineer in charge of work is B. Grand Mont. Three Rivers, Que.

Peterboro, Ont.
Tenders are being received till January 22, 1924, by the county council, through the clerk, Ed. M. Elliott, for the construction of a concrete arch bridge at Lakefield, Ont. Plans and specifications may be seen at the offices of the county clerk, Peterboro, Village clerk, Lakefield, and office of the engineers, A. W. Connor & Co., 34 Victoria St., Toronto.

Saugeen Harbor, Ont.
Plans are to be prepared for harbor improvements estimated to cost $120,000 which will include, dredging, remodelling and extending piers, etc.

Shawville, Que.
Work is to start shortly for bridge to be built over Mill Creek near here.

CONTRACTS AWARDED

Aubert Gallion, Que.
The following trades have been let on $100,000 steel bridge being erected here; piers and abutments—Chas. Jolicoenr, Beauceville; structural steel—Phoenix Bridge & Iron Works, Ltd., Montreal. Engineer in charge of work is Ivan E. Vallee, Parliament Bldgs., Quebec.

New Westminster, B. C.
Fraser River Pile Driving Co., Ltd , have been awarded the contract for extension to wharf at $2,964.87.

Three Rivers, Que.
The contract for repairs to Bureau Wharf has been awarded by the Three Rivers Harbor Commission, to Bourassa Clifford Corporation, Ltd. at $8,000.

Public Buildings, Churches and Schools

Burlington, Ont.
The city council contemplate erecting a municipal building and fire hall combined.

Fredericton, N. B.
Tenders for the erection of a seed extracting plant will be received till December 21, by the Dept. of Lands & Mines, through the minister, C. W. Robinson, Crown Land Office. Plans and specifications with minister. 5% accepted cheque required.

Grande Vallee, Que.
Pierre Levesque, architect, 115 St. John St, Quebec city, is preparing plans for alterations and finishing of church to cost $25,000. Tenders will be called in February of next year.

Grand Valley, Ont.
The Latter Day Saints Congregation of Grand Valley, will erect a new church here. Tenders will shortly be called for masonry, metallic ceilings, furnace and seating. All applications may be sent to J. T. Thompson, R.R. No. 4, Grand Valley, Ont

Hamilton, Ont.
Liberal Conservative Association contemplate building a hall in the southern section of this city.

Kingston, Ont.
W. Newlands & Son, Royal Bank Bldg, are preparing plans of $350,000 dormitory gymnasium on Russell St., for Regiopolis College.

Montreal, Que.
Tenders are being received till December 5 by the city council through the executive committee, for electric wiring, plumbing, heating and ventilating for city hall. Architect, Louis Parent, city hall.

Ottawa, Ont.
Tenders are being received by general contractors, Taylor & Lackey, Trust building, on sub-trades for $24,084 botanical laboratory. No closing date set.

St. Ferdinand D'Halifax, Que.
The erection of a convent here is contemplated by the Sisters of Charity.

St. Thomas, Ont.
Sarrach & Findlay, 430 Talbot St., are preparing plans of $40,000 public market to be built corner Talbot and Manitoba Sts. By-law covering this work is to be submitted to ratepayers early in December.

Toronto, Ont.
Darling & Pearson, architects, 2 Leader Lane, are receiving tenders till December 15 on all trades for addition to Toronto General Hospital. All tenders must be submitted on form of tender supplied by architects. Plans and specifications with architects.

H. N. Dancy & Son, 22 College St , are submitting a bulk tender and want prices on sub-trades, except masonry, in connection with addition to Toronto General Hospital, University Ave.

Wickson, Gregg & Brydon, Temple building, are preparing plans of $25,000 church to be erected on Ranleigh Ave., for Bedford Park Presbyterian church.

Trail, B. C.
Tenders will be received from December 15, 1923, till January 15, 1924, by Trail Memorial Building Society, Inc., through the chairman, B. A. Stimmel, for the construction of a $25,000 Memorial Hall here.

Winnipeg, Man.
Plans are being prepared for $100,000 Cadet College to be built corner Portage and Dominion Sts., for Salvation Army,

J. N. Semmens, 509 Great West Permanent Loan Bldg., Winnipeg, is the architect.

CONTRACTS AWARDED

Bellevue Park, Ont.
Foundations are in for $22,000 church for R. C. Corp. of St. Bonaventure. N. Normand, St. Patrick St., Ottawa, has the contract for plastering. General contractor is J. B. Daoust, Westboro. Architects, Brodeur & Pilon, Hull, Que.

Burnaby, B. C.
Percy & Weedon, 2105 Kingsway, are the general contractors for $6,471 addition to Edmonds school here. Architects, Bowman & Cullerne, Vancouver. Electric, plumbing, heating plastering, glazing trades not yet let.

Cardston, Alta.
The general contract for $146,000 school to be built here, has been awarded to Claydon Co., Ltd., Winnipeg, who will purchase materials and sub-let trades.

Fredericton, N. B.
The walls are up for $125,000 memorial building being built here for University of New Brunswick. Following subtrades have been let; electric—Vaughan Electric Co, St. John; heating— W. J. Shea, 80 Carleton St.; plumbing—H. W. Thorne, Phoenix St. Both of Fredericton Architect, F. Neil Brodie, 42 Princess St., St. John; general contractors, B. Mooney & Sons, 112 Queen St.

Haileybury, Ont.
The walls are up for $150,000 court house on Main St. Following sub-trades have been let; ornamental iron—Canadian Iron Co.; painting—F. G. Roberts & Co, Ltd. General contractors are Dickie Construction Co., Ltd. All of Toronto.

London, Ont.
The walls are going up for $18,000 parish hall for St. George Anglican Church. F. Cotton, 78 Empress Ave., has the contract for heating and plumbing. W. E. Dodd, 448 King St., is the general contractor. Architect, John M. Moore, 489 Richmond St.

Mount Royal, Que.
E. Tramblay, 13 Perrault Lane, has the roofing contract for $12,000 church hall being built on Stratford Rd. for Church of England. Electric to be let. Bremner Norris & Co., Montreal, are the general contractors. Architect, F. G. Robb, 127 Stanley St., Montreal.

Montreal, Que.
N. Lapierre, 518 Fabre St., has the plastering contract for school being built for Parish St. Pierre Claver. General contractor is J. C. Frenette. Architects, Bernier & Despatie.

Smith Marble & Contracting Co. have the contract for marble and tiling in connection with $228,111 school being built on Rielle St, Cote St. Paul. General contractors are Jas. Shearer & Co.; architect, J. S. Archibald, 314 Dorchester St. W.

Quebec, Que.
The contract for alterations to heating system of Examining Warehouse has been awarded to Brousseau & Frere, 324 St. Paul St., Quebec at $6,600.

Sackville, N. B.
The general contract for building post office here, has been awarded to E. F. Powers Construction Co., St. John, N. B., at $29,800.

Toronto, Ont.
The walls are going up for $54,000 sunday school and church for Ossington Ave. Baptist Church. Electrical work—Harry Alexander, Ltd.; plumbing and heating—A. R. Read. 692 Shaw St. Architects, Shepard & Calvin.

Victoria, B. C.
Luney Bros., Ltd., have been awarded the general contract for $150,000 high school to be built here. Architect, C. Elwood Watkins, Broad St., Victoria.

Windsor, Ont.
Jos. L. Heaurex, Wyandotte St, has the plumbing and heating contract for laundry and bed rooms to be built for St. Mary's Academy, costing $36,000. General contractor is Urgel Jacques, 600 Dougall Ave.

Business Buildings and Industrial Plants

Edmonton, Alta.
Canada Creosoting Co. Ltd., of Toronto, Ont, contemplate erecting a creosoting plant here.

Fort William, Ont.
Canadian Pacific Railway contemplate building an hotel here to cost $700,000.

Kincardine, Ont.
J. B. Watson Furniture Co. contemplate an extension to their factory to cost $20,000. By-law will probably be submitted to ratepayers shortly.

Kemptville, Ont.
McMaster Lumber Co, Ltd., are having plans prepared for altering power house for mill at a cost of from $3,000 to $4,000.

Magog, Que.
W. G. Stock contemplates building an $8,000 garage on Main St.

Middleton, N. S.
Massey-Harris Co., Ltd., will build a warehouse here. Local tenders will be called in spring.

Montreal, Que.
The walls are going up third floor for $125,000 office building on Victoria Pier, owned by Harbor Commission. Roofing, plastering and elevators to be let. General contractors are Collet & Freres, 243 St. Hubert St. Architect, T. Daoust, 61 St. James St.

Port Arthur, Ont.
United Grain Growers, Ltd., of Winnipeg, are planning an addition to their elevator here estimated to cost $1,200,000. This will increase the capacity of their elevator by 1,000,000 bushels.

Prince Rupert, B. C.
Plans are being prepared for erection of an apartment block on Third Ave. at a cost of $30,000. Arthur Brooksbank, Prince Rupert, is the owner. Work will start in the spring.

Quebec, Que.
Raymond & Dionne, 70 Laliberte St., Quebec, Que., are preparing plans of $30,000 club hall to be built corner Fleury and Crown Sts., for La. Garde Champlain.

Toronto, Ont.
The Toronto Hunt Club will start work in the spring on their new club house to be built south side Orchard View Blvd. near Oriole Parkway. The cost is estimated at from $70,000 to $100,000.

Tenders are being received by the owner, R. McClelland, Capital Theatre, Yonge St., Toronto, on electric, plumbing, steam heating, plastering, painting and sheet metal work in connection with addition to "Capital" theatre, stores and offices, corner Castlefield Ave. and Yonge St. Architect, Murray Brown, Confederation Life Bldg.

Victoria, B. C.
Work has commenced for $15,000 shingle mill, owned by Canadian Puget Sound Lumber Co.

CONTRACTS AWARDED

Barrie, Ont.
R. F. Garrett has the general contract for factory to be built on Maple Ave. for Warren & Ryan Co.

Hamilton, Ont.
Pouring concrete on 7th floor is being done on new Lister building. F. G. Roberts & Co., 106 Wells St., Toronto, has the painting contract, and J. & G. Inrig, 206 Locke St., Hamilton, the roofing contract. General contractors are Pigott-Healy Construction Co. Architect, B. H. Prack, Bay St., Toronto.

Montreal, Que.
Cook & Leitch, 358 Beaver Hall Hill, are the general contractors of repairs to warehouse at 84 St. Peter St, costing $14,000, for Estate O. Fisher, 560 Sherbrooke West.

Steel is going up on $15,000 warehouse being built corner Atwater and Centre, for Sherwin Williams Co. Anglin Norcross, Ltd., are the general contractors. Architects, T. Pringle & Sons, Ltd.

Mimico, Ont.
Foundations are in for $10,000 theatre being built here. R. Herod & Son, Mimico Beach, are the general contractors. Carpentry and roofing by owner, W. J. McClintock, Lake Shore Rd., who buys material. Masonry by general contractors. Painting, plastering, electric, plumbing and heating to be let.

Ottawa, Ont.
The following sub-trades have been let on $14,000 garage being built on Wellington St. for D. Charleboise, 691 Wellington St.; electric—Mr. Donelly, care general contractor, J. B. Daust; plumbing and heating—M. Archambault, Hull, P. Q.; plastering—N. Normand, St. Patrick St. Painting by daywork.

H. Dagenais, 158 St. Patrick St., has been awarded the general contract for factory to be built on Murray St. for F. H. Plant, Ltd.

J. D. Sanderson Co., have the contract for roofing of $25,000 garage, machine shop and power house owned by the Ottawa Electric Rly. Co. Masonry, John Sutherland, care architects, Richards & Abra. Plumbing and electric by owners.

Ridgeway, Ont.
Foundations are in for $67,000 club house for Cherry Hill Club Robertson-Cataract Co., Buffalo, N. Y., have the contract for electrical work, and C. Cald-

well, Ridgeway, Ont., the heating and plumbing. Albert Nye. Bridgeburg, Ont., is the general contractor.

Toronto, Ont.

Excavation work is being done for addition to residence for offices, etc., at 1301 Bloor West, owned by Norman Baird, 1301 Bloor W. Following sub-trades have been let; masonry—Demarco & Co.; carpentry—Robt. Thompson, 673 Shaw St. Balance of trades to be let.

The following sub-trades have been let on $100,000 manufacturing building being erected north east corner Spadina Ave. and Phoebe St.; electric wiring—Canada Electric Co.; painting—S. Fish & Co, 48 Lippincott St. General contractor is L. E. Dowling, 167 Yonge St.; architect, B. Brown, 287 Spadina Ave.

Drummond Bros., 540 King W. have the painting contract on alterations to store for cafeteria at 185 Yonge St. Architects, N. A. Armstrang Co., Ltd., 7 King E.

W. B. Charlton, 12 Kendal Ave. is the general contractor for $15,000 store and dental suite corner Dundas and Centre Ave, and will let painting, plastering, plumbing, heating and electric trades. Owner is C. J. Halloran, 202 Dundas West. Architect, Benj. Swartz, 336 Dundas W.

The walls are going up for $15,000 addition to garage rear 3421 Yonge St., owned by B. R. Amodeo, 1216 St. Clair W. D. Joy, care architect, 336 Dundas West, is the general contractor Plastering, painting, heating and plumbing to be let.

The walls are going up in connection with rebuilding of club house for Parkdale Canoe Club. Geo. L. Robinson, 107 Armstrong Ave. has the contract for carpentry work. Architects, Molesworth, West & Secord, Toronto.

Vancouver, B. C.

Smith & Webber, 2220 Sixth Ave. E., are the general contractors for $24,000 apartment block to be built at 1118-20 Harwood St. Heating contract has been let to Vancouver Gas Co.

A. D. Snider & Son, 198 Hastings St. have the general contract for $12,000 patent medicine factory for Joto Manufacturing Co. F. W. Banks, 3735 Georgia St. E., has the contract for electrical work. Painting trade not yet let.

Windsor, Ont.

Foundations are going in for $35,000 addition to branch bank of Bank of Montreal. The following sub-trades have been let; reinforced steel—Trussed Concrete Steel Co. of Canada, Ltd., Toronto; structural steel—Canadian Bridge Co., Walkerville; general contractors are Dickie Construction Co., Ltd., Toronto. Architect, Kenneth G. Rea, 285 Beaver Hall Hill, Montreal, Que.

Wells & Gray, Ltd., have the general contract for $18,000 addition to telephone exchange. Architect is W. J. Carmichel. Electric and plumbing to be let. No materials purchased.

Residences

Hamilton, Ont.

W. J. Holland, 63 Victoria Ave N., is the owner and general contractor of 4 residences, $8,000 being erected on McAnulty Blvd.

Tenders are being received by the owner, J. M. Peregrine, 74 Queen St. S., in connection with altering residence into apartment, at 23 Duke St. No closing date set.

E. G. Budd, 294 Grosvenor N., contemplates building 3 residences in Paisley Gardens. This work is to start in the spring.

Work has just started for 2 residences, $8,000, at 121-3 Ottawa St. S. Owner and builder is J. Vickers, 35 Elm St.

Kingsville, Ont.

Jesse Sherman is the owner and general contractor of 2 residences, $6,000, being built on Beech St.

Kitchener, Ont.

Work is to start shortly on $6,000 residence to be built on Lancaster St. Owner and general contractor is Charles Williams, 213 Mill St. Masonry, carpentry, electric, plumbing, heating, plastering and painting to be let.

Work is to start shortly for $5,000 residence on Lydia St. S. F. Dippel, 36 Pequegnat Ave., is the owner and general contractor. Masonry, electric, heating, plumbing, plastering and painting to be let.

Montreal, Que.

D. J. Crighton, 851 Oxenden, is preparing plans of apartment house to be built corner Sherbrooke and University. Wrecking present building will probably be done by owners, Asch Ltd., 51 Sherbrooke W. Tenders will be called for general contract by January 2nd.

Foundations are going in for $10,000 residence on Bourbonniere, between Boyce and Hochelaga. Owner and builder is A. Deschamps, 1042 Delorimier Ave., who will let masonry, roofing, electric, plumbing and plastering. Carpentry, painting and glazing by day labor.

Foundations are in for 1 store and 6 flats, south east corner 4th Ave. and Masson St. Ros., for Tom Vangel, 1665 Masson St. Tenders are being received till December 10, by the architect, J. E. DePatrick, 381 Fourth Ave., Ros., on reinforced steel, art stone, carpentry, millwork, roofing, electric, plumbing, heating, ventilating, plastering, painting and glazing, tiling and ornamental iron.

Framework is going up for $9,000 residence on Delorimier, between St. Jerome and Masson. A. Laquerre, 1647 Chabot, is owner and builder. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Excavation work is being done for $9,000 residence on Deserres, between Blvd. Gouin and St. Leon. E. Lapierre, 2 Deserres, is the owner and builder. Roofing, electric, plumbing, plastering and painting to be let. Masonry and carpentry by day labor.

Foundations are going in for $8,000 residence on Delorimier, between Sherbrooke and Gauthier. D. Legault, 84 Laval, is owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $8,000, on De Gaspe, between Villeray and Gounod. D. Marcil, 887 Durocher, is owner and builder. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Ravary Ltd., 2115 St. Catherine St. E., contemplate building a store and flats on St. Catherine St. E.

Foundations are in for $33,000 residence on Verdun Ave. Perras & Goulet, 1501 Wellington, are the owners and builders. Masonry, roofing, electric and plastering to be let. Carpentry by day labor. Plumbing, heating, painting and glazing by owner. No material purchased.

V. Valeky, 197 Bromby, is owner and builder of $8,000 residence on Mazarin, between Allard and Rondot. Brickwork, millwork, roofing, electric and plumbing trades to be let. No materials purchased except lumber.

Foundations are in for $8,000 residence on St. Denis, near Isabeau. G. Besner, 2604 St. Denis St., is owner and builder. No materials purchased. Masonry, roofing, electric, plumbing, heating, plastering and glazing to be let. Carpentry, day labor.

Z. Lamoureux, 2282 St. Denis St., is owner and builder of $12,000 residence near 2376 St. Denis St. No materials purchased. Masonry, roofing, electric, plumbing, heating, plastering, painting and glazing to be let. Carpentry, day labor.

Milton, Ont.

Foundations are in for $6,000 residence on Commercial St. Owner and builder is Sam Hensan. Materials all purchased.

Outremont, Que.

Foundations are going in for 4 flats, $15,800, on McEachran, near Van Horne. A. Boileau, 848 Champagneur, is owner and builder. Sub-trades to be let.

Work will start shortly for $28,500 cottage to be built on Peronne Ave. N. Deslauriers, 406 Sherbrooke E., is the owner.

Ottawa, Ont.

Tenders are being received till December 12, by general contractor, Geo. A. Eaman. 102 First Ave, on electric plumbing, heating, plastering for $9,000 double residence being erected on Fairbairn Ave.

Graves Construction Co., Ltd., are the owners and general contractors of 2 residences, $10,000, on Sunset Blvd. 16,000 bricks and materials for 60 cu. yds. concrete tnd 1,600 sq. yds. of plaster required.

Foundations are in for $9,000 residence on Daly Ave. Owner and general contractor is A. W. Davidson, 254 Cooper St., who is receiving tenders, closing about December 8, on electric, heating, plumbing and plastering.

David Younghusband, 322 Cooper, is the owner and general contractor of $6,000 residence to be built on Grove Ave. No materials purchased. 10,000 bricks and materials for 30 cu. yds. plaster required.

Point Grey, B.C.

Woodburn & Chaytor are the owners and builders of $7,500 residence at 4657 Connaught Drive. Electric, plumbing, heating and plastering trades not yet let.

Russell, Ont.

Alex. McKeracher is the owner of $6,000 residence being built on Mill St. Work is being done by day labor. No materials purchased except cement.

Sydney, N.S.

A. J. McCormack, Ross Block, Sydney, is preparing plans of shops and residences to be built on Charlotte St., at a cost of $16,000. Owner is J. Hamburg, Glace Bay, N. S.

Toronto, Ont.

Chas. A. Burrows, 44 Benlamond Ave., is owner of $10,000 residence to be built at 20 Douglas Drive, and is receiving tenders for general contract for entire building. 2 stories, 32 x 28, brick construction.

N. J. Liscombe, 55 Keystone Ave., is the owner and builder of 2 pair residences, $7,000 pair, west side Kingston Rd., near Queen East. Masonry by day labor. Plumbing, heating, painting, plastering and electric to be let by owner.

Foundations are going in for 4 pairs residences, $30,000, east side Rosethorne north east corner Turnberry. Jas Crang, 156 Oakwood Ave is the owner and builder, and employs own staff.

Foundations are going in for $15,000 duplex residence, south side Grimthrope Ave. near Atlas. Owner and builder is S. A. Griffin, 48 Vimy Ridge Ave. Tenders are being received on sub-trades. Architect, D. H. Burnham, 260 Lauder Ave.

Excavation work is to start shortly for 7 bungalows, $5,000 each, on Runnymede Rd. Owner and builder is A Galbraithe, 544 Runnymede Rd. Architect, D. H. Burnham, 260 Lauder Ave. Plumbing, heating, painting, plastering and electric to be let. Masonry by day labor.

Work is to start at once for 2 bungalows, $5,000 each, south side Poulton Ave., near Monarch Park. R. G. Sprague, 775 Coxwell Ave., is the owner and will let plastering, painting, heating, electric and plumbing trades.

B. Swartz, 336 Dundas W., is preparing plans of block stores and apartments to cost $45,000, corner St. Clair and Northcliffe Blvd. Rapid Building Construction Co., 77 Queen W., are the owners. Tenders for this work will shortly be called.

Tenders are being received by the architect, Benj. Swartz, 336 Dundas W., on all trades in connection with stores and apartments, $12,0000, south side Bloor West, near Parkside Drive, for B. Douglas; 117 D'Arcy St.

Piers are in for 8 residences, $1,500 each, south side Cranbrooke Ave., near Elm Road. Wm. Archer, 46 Soudan Ave., is the owner and builder. Tenders are being received on electric, plastering, heating, painting and plumbing.

Excavation work is being done for $9,000 residence corner Edith Drive and Orchard View Blvd. Wm. A. Scott, 58 Edith Drive, is owner and builder. Plumbing, heating, painting, plastering and electric to be let. Masonry by day labor.

P. L. Speirs, 92 Northcliffe Blvd., is owner and builder of $12,000 residence, east side Dunvegan Rd., near Russell Hill Rd. Tenders are being received on plastering, plumbing, painting, heating and electric.

Wm. Moad, 46 Oakwood Ave., is the owner of $18,000 residence and garage being built north east corner Northcliffe and Rosemount. Tenders are being received on plastering, plumbing, painting, heating and electrical trades.

Work is to start shortly for 2 residences, $4,000 each, at 766-8 Coxwell Ave. Day & Hill, 480 Strathmore Blvd., are the owners and builders. Painting, electric, plastering, plumbing and heating to be let.

Tenders are being received by the owner, Thornton Eyre, 83 Balmoral Ave., on all sub-trades in connection with 2 residences, $6,000 each, to be built north side Briar Hill, near Avenue Rd.

Tenders are being received by the architect, Benj. Swartz, 336 Dundas W., on all trades for 2 stores and apartments, $20,500, to be built at 3237 Yonge St.

Tenders are being received by the owner and builder, Duncan Monroe, 65 Lawton Blvd., on electric, plastering, heating, painting and plumbing for 8 residences, $5,000 each, being built on west side Oriole Parkway near Orchard View Blvd.

Tenders are being received by the owner, Ed. C. Warren, 88 Glengrove Ave., on electric, painting and plastering for $7,500 residence to be built north side Glengrove Ave., near Heather St. Heating and plumbing not definitely signed.

Excavation work is to start shortly for $10,000 residence on Evelyn Crescent. Jas. MacDonald, 379 Lansdowne Ave., is the owner and builder. Plastering, plumbing painting, heating and electric to be let.

Tenders are being received till December 11, by the city of Toronto, through C. A. Maguire, chairman Board of Control, for installation of sanitary conveniences in a number of residences. Specifications, etc., at office of Medical Officer of Health, city hall.

Work is to start shortly on 2 pair residences, $7,500 each, north side Robins, near Coxwell Ave. Robt. Muir, 20 Linsmore Crescent, is owner and builder, and will let painting, electric, plastering, plumbing and heating trades. Masonry day labor.

Foundations are going in for 1 pair residences, $7,500, west side Kingswood Rd., near Swanwick Ave. Owner and builder is H. McCaffery, 25 Meagher Ave. Painting, plastering, heating, electric and plumbing to be let. Masonry, by day labor.

Work will start in the spring for 2 residences, $4,000, east side Pullen Ave., near Gerrard E. A. E. Petton, 8 Fairmount Crescent is owner and builder.

Footings are going in for $7,000 residence west side Harvie Ave., near Eglinton. E. Stewart, 69 Rogers Rd., is owner and builder.

S. M. Styles, 19 Normanna Ave., is owner and builder of 2 residences, $3,500 each, east side Earlscourt Ave., near Hatherley. Plastering, plumbing, electric, heating and painting to be let.

Footings are going in for $7,000 residence north side Ostend Ave., near Windermere. J. M. Bentley, 517 Runnymede Rd., is owner and builder, and employs regular staff.

Excavation work is being done for 2 residences, $9,500 each, north side Dundurn Ave., near Barrie Ave. E. J. Blackmore, 1057 Davenport Rd., is the owner and builder. Masonry and carpentry work by day labor. Tenders are being received on plastering, plumbing, electric, heating and painting.

Work is to start at once on 1 pair residences, $9,500 each, on Wiley Avenue. Owner and builder is H. Walker, 230 Langley Ave. Plastering, plumbing, electric, heating and painting to be let.

Tenders are being received by the owner, J. Grant, 42 Redpath Ave., on tiling, electric, plumbing, heating, painting and plastering on $9,000 residence being built south side Alexandria Blvd., near Heather St. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade.

F. Cunningham, 81 Lyall Ave., is owner and builder of 1 single and 1 pair residences $9,200, west side Kingswood Rd., near Swanwick Ave. Painting, electric, plastering, plumbing and heating to be let.

Wm. R. Worthington, 57 Lascelles Blvd., is owner and builder of 3 residences, $5,500 each, east side duplex Ave., near Cashin Rd., and will let plumbing, heating, painting, electric and plastering trades. Carpentry day labor.

Vancouver, B. C.

J. S. Shaver, 1815 11th Ave. W. is owner and builder of $7,500 residence on 32nd Ave. Electric, plumbing, heating, plastering not yet let.

R. T. Perry, 104 London Building, is preparing plans of $7,000 residence to be built on 2800 block, 6th Ave. W., for F. W. Smelts. Tenders for this work will be called shortly.

Verdun, Que.

D. Rolland, 103 Second Ave., is owner and builder of $14,000 residence on Third Ave. Masonry, roofing, electric, plumbing, plastering and painting trades to be let.

Foundations are in for $9,000 residence on Second Ave. A. St. Laurent, 167 Gordon Ave., is the owner and builder and will let masonry, millwork, roofing, electric, plumbing, plastering and painting. No materials purchased.

F. X. St. Armour, 326 Mullarky Ave., is owner and builder of $11,000 residence here. Masonry, roofing, electric, plumbing, plastering and painting to be let. Carpentry day labor. No materials purchased.

Excavation work is being done for $7,000 residence on Second Ave. Owner is O. Mongeau, 1002 Verdun Ave., and will let masonry, roofing, electric, plumbing and plastering trades. Carpentry, painting and glazing by day labor.

E. Descheneaux, 1194 Evelyn, is owner and builder of $6,000 residence on Second Ave. Masonry, roofing, electric, plumbing and plastering to be let. Carpentry, painting and glazing by day labor.

Winnipeg, Man.

Foundation is going in for $10,000 residence on Wolseley Ave. Lount Engineering Co., Ltd., are the owners and builders, and will sub-let trades.

CONTRACTS AWARDED

Hamilton, Ont.

Geo. Clapham, 19 Dalkeith Ave., has the contract for plastering, and Mr. Morrison, care owner, the plumbing and heating, for $15,000 stores and apartments on Main east, between Tuxedo and Kenilworth. Painting by owner and general contractor, H. J. McQuillan, 668 Main East.

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Hydro Electric Power Commission of Ontario

Sealed tenders marked "Tender for Rest and Guard Piers Chippawa," for the construction of two rest piers, two guard piers and two fenders, in connection with the M.C.R. swing bridge over the Welland River at Chippawa, Ontario, addressed to the Chief Engineer, Hydro-Elecric Power Commission of Ontario, 190 University Avenue, Toronto, will be received up to 10 A.M.,

December 13th, 1923,

Plans, Specifications, Form of Contract and Tender can be seen on application to T. U. Fairlie, Railway Engineer, Corner of Centre Ave. and Elm St., Toronto.

The Commission does not bind itself to accept the lowest or any tender.

W. W. POPE,
Secretary,
Toronto, November 29th, 1923. 49

Tenders for Concrete Arch Bridge

COUNTY OF PETERBORO

Sealed tenders will be received by Ed. M. Elliott, County Clerk up till 2 p.m.

Tuesday, January 22nd, 1924,

for the construction of a concrete arch bridge at Lakefield, Ontario.

The bridge consists of 2 open spandrel arch spans of 109′ and 84′ with 20′ roadway and one 6′ sidewalk, the total estimated quantity of concrete being 658.3 cu. yds.

Intending bidders are advised to see the site at once.

Plans and specifications may be seen at the Offices of the County Clerk at Peterboro, the Village Clerk at Lakefield and the Undersigned.

A marked cheque or bid-bond for 5% of the amount of the tender must accompany it as guarantee of good faith.

The lowest or any tender not necessarily accepted.

A. W. CONNOR & CO.,
County Engineers,
34 Victoria St., Toronto.
48-49

FOR SALE

Ten Ton Holt Caterpillar Tractor

For sale at decided bargain, as owner has no further need for same.

Box No. 407, Contract Record, Toronto. 44 T.f.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

DEPARTMENT OF RAILWAYS AND CANALS, CANADA. WELLAND SHIP CANAL

Section 8

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tenders for Section 8, Welland Ship Canal," will be received at this office until 12 o'clock noon, on

Thursday, December, 27th, 1923,

Plans, specifications and form of contract to be entered ino can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in Charge, Welland Ship Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of fifty dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for the sum of $550,000 made payable to the order of the Minister of Railways and Canals, or War Loan Bonds of the Dominion of Canada to the same amount or War Loan Bonds and cheques if required to make up the difference, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque or bonds of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order,
J. W. PUGSLEY,
Secretary.
Department of Railways and Canals,
Ottawa, November 29th, 1923. 49-50

TOWNSHIP OF ETOBICOKE

Sanitary Sewer

Sealed tender plainlq marked as to contents will be received up to 5 o'clock P.M. of

Friday, December 14th, 1923,

for the supplying and laying of approximately 1400 feet of 8-inch sewer.

Plans and specifications may be seen and form of tender obtained at the Township offices, Islington, on or after Monday, December 10th, 1923.

The lowest or any tender need not necessarily be accepted.

N. MacNICOL,
Township Engineer,
49 Islington, Ont.

Drums for Wire Rope

Where a grooved drum is used for wire rope, and the rope wound more than one layer, the pitch of the grooves should be not more nor less than 1/8 in. larger than the rope diameter; this will give an ideal winding condition for the first layer, if the fleet angle is not too great, and will permit a good groove condition for the second layer. If the pitch is too small, it is apt to cause crowding or rubbing of one wrap of rope against the other, and if a second or third layer is added on a close-pitch groove drum the additional layers of rope will be subject to severe abrasion. The grooves should also be made of a slightly larger radius than the rope, so that the rope will not wedge or pinch in the groove.

Water Used for Motor Fuel

The Manchester Guardian Commercial, in the issue of October 25th, gives particulars of an automatically operated device which enables water to be used, as an admixture of petrol, for motor fuel. The water is used in the form of superheated steam and the exhaust manifold of the engine is used to vaporise the liquid and superheat it. In this form it passes to a special carburetter, which is the basic feature of the device. To this carburetter both petrol and steam feed are connected. On starting, the power is given by petrol fed through a slow-running jet, and this petrol is electrically assisted to vaporise quickly. The result is that the mixture can be brought into action within eleven seconds.

Novel Method of Shipping Locomotives

A novel expedient has been adopted by Sir W. G. Armstrong, Whitworth and Co., Limited, in shipping to India seventeen locomotives in such a condition that they are almost ready for immediate service. In fact, the only dismantling necessary before the engines were put aboard the steamer was the removal of the buffers. Some of the locomotives were stowed in the holds and the remainder on deck, under waterproof covers. Engines have, of course, been dispatched in this manner to continental and Irish ports, but never before for such long voyages. The advantage to the purchaser is obvious, as the locomotives can start their useful life much sooner than if they have to be re-erected abroad.

Residences

CONTRACTS AWARDED

(Continued from page 53)

Kemptville, Ont.

Dominion Concrete Pipe Co., Ltd., have the general contract for $7,000 residence to be built on Thomas St., for Edith S. Anderson. No materials purchased .

Louiseville, Que.

Jos. Desrosiers, Louiseville, has the general contract for $6,000 residence to be built on Notre Dame St., for Ferdinand Lessard, Ste. Ursule St. Electric, plumbing and plastering to be let.

London, Ont.

Watson & Holmes, 798 Adelaide St., are the general contractors for $15,000 store and apartment to be built on Dundas St. E. Mrs. T. Wolfe, 759 Dundas St., is the owner.

Mount Royal, Que.

E. Tremblay, 13 Perrault Lane, has the contract for roofing, plumbing and heating of four residences, $30,000 being built for Model City Housing Co., Montreal. General contractor is Bruno St. Pierre, 3448 Henri Julien Ave., Montreal.

Montreal, Que.

Foundations are in for 3 residences, $15,000, on Denormanville, between De Fleurimont and Bellechasse, for F. Tremblay & Cie, 400 Williams. J. Cody, 2934 Drolet, has the general contract. Millwork by owners. Roofing, electric, plumbing, plastering, painting and glazing to be let.

Richardson Simard & Co., 745 Clarke St., has the contract for roofing of $12,500 residence on Dunlop Ave., for J. A. D. Annette, 1727 Hutchison. Cook & Leitch are the general contractors.

H. R. Cassidy, 255 Regent St., has the contract for electric work on $20,000 residence on Courte, between Fort and Chomedy, for J. R. Douglas, Canada Cement Building. Painting and glazing to be let. General contractor is A. K. Hutchison, 10 Cathcart St.

F. Chartier, 251 Fullum St., has the roofing contract on $15,000 residence being built on Chateaubriand, between Belanger and St. Zotique. E. P. Belair, 159 Dufresne, is owner and builder.

Work is in progress for repairs costing $25,000, to residence at 443 University St. Following sub-trades have been let: structural steel—Phoenix Bridge & Iron Works, Ltd.; electric—Vincent & Say Electric Co. Masonry by general contractors, Purdy & Henderson Co., Ltd. Millwork, plastering, painting and glazing to be let. Architects, Ross & MacDonald.

Trimming interior is now being done on $150,000 apartment house on Dorchester St. Nard Construction Co. are the owners and builders. Roofing, Dominion Sheet Metal Works; masonry—R. Corrodo, care owners.

Allard & Cie, 558 Adam St., are the general contractors of $8,000 residence on LaSalle, between Notre Dame and Ste Catherine, for C. Robitaille, 43 Cote Place D'Armes. Brickwork—D. Savard, 713 Letourneux. Roofing, electric, plumbing, plastering, painting and glazing to be let.

A. Boileau, 848 Champagneur, has the general contract for store and 4 residences, total cost $15,000, to be built corner Joliette and Ontario St. E., for Dr. Jeffroy, care architect, J. A. S. Houle, 55 St. Francois Xavier. Sub-trades to be let.

The following sub-trades have been let on 2 residences, $15,000, being built on St. Valier, between Belanger and Isabeau, for E. Leonard, 3035 Christophe Colomb; masonry—Chas. Lamontagne, care general contractor; roofing and plumbing — D. Kochenburger, 2739 St. Hubert St.; electric—Mr. Laurin, care general contractor, J. Labelle, 3528 Christophe Colomb. Painting and glazing day labor. Plastering to be let.

New Westminister, B. C.

The following sub-contracts have been let on $20,000 residence on Queen's Ave. for Chas J. Coulter, 1015 Hamilton St, Vancouver; millwork—R. D. Helmer, 996 Sixth Ave. W.; plumbing—Orr Bros.; painting and glazing—Duncan Campbell, 2277 11th Ave. W. General contractor is J. K. Sinclair. Architects, Townley & Matheson. All of Vancouver.

Outremont, Que.

The following sub-trades have been let on $14,000 cottage on Outremont St. Catherine Road; plastering—A. Normand, 3159 Casgrain; tiling—H. Capra, 2795 Drolet; painting and glazing by general contractor, Denis Construction Co.

Gody & Tombini, 2934 Drolet, are the general contractors for $10,000 cottage being built on Dollard Blvd., for Z. Filion, 823 St. Hubert. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing and tiling to be let.

Foundations are going in for 2 flats, $13,000, on Davaar, near McEachran, for R. Buddo, 600 Marquette. D. Abel, 878 McEachran, has the general contract. Sub-trades to be let.

Ottawa, Ont.

J. B. Daust, Carleton, has the general contract altering shop to apartments, $11,000, on Arlington Ave., and is receiving tenders on electric, heating, plumbing and plastering. No closing date set. Balance of work by day labor.

Following sub-trades have been let on $14,000 residence being built on Driveway, for Percy Sparks, 3 Kent St.; electric—H. L. Allen, 272 Bank St.; plumbing and heating — McKinley & Northwood; plastering — Murphy & Morrow; painting—G. Green, Bank and Fourth Ave. Balance of work by day labor.

The walls are going up for 2 residences, $10,000, on Bronson Ave. Following sub-trades have been let; electric —H. L. Allen, 272 Bank St.; plumbing and heating—G. Renwick, care owner; plastering, Mr. Beamont, care owner, Caleb Brookes, 590 Driveway. Painting by day labor.

Oshawa, Ont.

The walls are going up for $7,000 residence on Alma St., for John McMaster, 124 Alma St. D. Powler is the general contractor. Plumbing and heating is being done by Fred Gusot, Grooms Ave.

Three Rivers, Que.

Jos. Boisvert, 37 Des Commissaires, has the general contract for stores and residence, $8,000, to be built on St. Paul St. for Ludger Masse, 38 Ste. Cecile St.

Toronto, Ont.

D. H. Burnham, 260 Lauder Ave., has drawn plans of 1 pair residences to be erected on Erskine Ave. for G. H. Webb, 448 Summerhill Ave. The following sub-trades have been let; plumbing—Geo. Moore, Hedford Park Ave.; heating—Geo. Nunn, 356 Spadina Ave.

The following sub-trades have been let on $126,000 apartment house being built south west corner Homewood Ave. and Wellesley Crescent; excavation — Dufferin Construction Co.; brickwork—P. Rodaro, 437 Symington; carpentry (labor only)—A. Layevsky, 276 Crawford. Owner is D. Lavine, care architects, Kaplan & Sprachman, 298 Dundas W.

The following sub-trades have been let on 2 stores and apartments, $12,000, north west corner Yonge and Melrose; masonry—F. & E. Ham, 85 Salem Ave.; roofing—Toronto Sheet Metal Works; plumbing—Art Key, 54 Arlington Ave.; glazing and glass—Consolidated Plate Glass Co. of Canada, Ltd.; painting—Geo. West, 724 Rhodes Ave.; plastering —F. Morette; carpentry—J. Tait & Co., care architect, Benj. Swartz, 336 Dundas W. Heating to be let.

Howard Furnace Co. have the contract for heating of 2 pair residences, $7,500 a pair, east side Ladykirk, near Fourth Ave. W. Padfield, 69 Chisholm Ave., is the owner and builder and employs own staff for electric, plastering and plumbing. Masonry and painting by day labor.

H. J. Overbough, 211 Oakmount, has the general contract for 2 residences, $4,500 each, north side Cranbrooke Ave., near Elm Road, for Thos. G. Hunthorn, 192 Roselawn Ave. Sub-trades to be let by general contractor.

Following sub-trades have been let on 4 residences, $4,000 each, south side Clements Ave., near Avenue Rd.; carpentry — W. Scott, 33 Cedarvale Ave.; plastering—Kee & Son, 451 St. Clarens Ave.; heating—Peerless Furnace Co., 548 College St.; electric—G. Armstrong, 1217 College St.; painting—W. Chilcott, 965 Lansdowne Ave.

Geo. Franks, 178 Quebec Ave., has the contract for carpentry work, and F. & A. E. Ham, 85 Salem Ave., masonry work, on $12,000 store and apartment at 946 St. Clair W. Tenders on other trades are being received by the architect, B. Swartz, 336 Dundas W.

The following sub-trades have been let on 2 residences, $5,000 each, south side Craighurst Ave., near Rosewell Ave.; heating—Wm. Boyd, 18 Austin St.; plastering—Robt. Irving, 494 Lansdowne Ave.; plumbing — Christopher Bros., 20 Astley St. Wm. Rayfield, 495 Sherbourne St., is owner and builder. Painting by day labor.

Foundations are going in for 6 pair residences, $7,000 a pair, south side Orchard View Blvd., near Duplex Ave. J. Godoun, 255 McCall St., has the contract for masonry. Other trades to be let. Grimshaw Bros., 2033 Yonge St., are the owners and builders.

The following sub-trades have been let on 1 pair residences, $7,000, south side Montgomery Ave., near Yonge St.; heating—L. C. Carstead, 9 Redpath St.; plumbing—G. C. Lath, 8 Davisville Ave.; electric—G. Sheppard, 338 Davisville Ave. Painting by owner, D. D. Reid, 76 Montgomery Ave. Tenders are being received by owner on lathing and plastering.

Sub-trades as follows have been let on $7,000 residence being built north side Alexandria Blvd.; electric—E. Warman. 209 Soudan Ave.; plumbing and heating —W. R. Willis, 189 Broadway Ave.; plastering—T. Coath, 34 Albany Ave. Painting to be let. F. Markham, 156 Alexandria Blvd., is the owner and builder.

The following sub-trades have been let on 4 residences, $3,000 each, east side Edith Drive, near Eglinton Ave.; plumbing—Harry Rushby, 219 Wychwood Ave.; heating—L. C. Carstead, 9 Redpath St.; plastering—W. Simpson. Painting by owner, Thos. W. White, 267 Balliol St.

Trimming interior is being done on 1 pair residences, $7,000, north side Castlefield Ave., near Rosewell. Following sub-trades have been let; plastering—Clarke Bros., 203 Bedford Park Ave.; heating—Geo. Nunn, 356 Spadina Ave.; plumbing—Geo. Moore, Bedford Park Ave.; painting—R. J. Greenway, 28 Roslin Ave.; electric—Horton & Douglas, care owner and builder, Godfrey B. Webb, 76 Orchard View Blvd.

The walls are going up for $8,000 residence, north side Glen Grove Ave., near Duplex, for Mrs. Margaret Abbott, 238 Arlington Ave. F. Foley, 133 Lansdowne Ave., is doing the masonry work. Other sub-trades to be let by general contractor, F. Waite, 745 Euclid Ave. Architects, J. Hunt Stanford & Son, 67 Yonge Arcade.

Following sub-trades have been let on 4 pair residences, $6,000 a pair, on east side Henning, near Eglinton Ave.; plumbing—J. Walker, 88 Malvern Ave.; heating—L. C. Carstead, 9 Redpath St.; plastering—G. T. Pritchards, 98 Dawes Rd.; masonry—Wm. Roberts, 179b Coxwell Ave. Painting by day labor. Owner and builder is Geo. Nicholson, 6 High Park Gardens.

B. B. Royle, 147 Ascot Ave., has the plastering contract on $10,000 residence being built at 209 Glencairn Ave. Painting day labor. Owner and builder is A. L. Sanagan, 3 St. Leonards Ave.

Excavation work is in progress for 1 pair residences, $7,000, north side Gerrard E., near Hollywood Crescent. Owner and builder is A. Cornell, 127 Normandy Blvd. Masonry work has been let to Mr. Alderstead, 12 Osborne Ave.

The following sub-trades have been let on 7 residences, $4,300 each, west side Hemlock Ave.; electric—T. B. Kilner, 601 Jones Ave.; plumbing—W. J. Merrill, 862 Kingston Rd.; heating—Toronto Furnace Co. Painting by day labor. Owner and builder is Fred Lankin, 223 Fulton Ave.

Following sub-trades have been let on $7,000 residence being built north side Alexandria Blvd.; electric—E. Warman, 209 Soudan Ave.; plumbing and heating —W. R. Willis, 189 Broadway Ave. Plastering and painting to be let. F. Markham, 156 Alexandria Blvd., is owner and builder.

C. P. Manning, 88 Walmsley Blvd., is the builder of $7,000 store and apartment south side Eglinton Ave., near Pitman Ave. Owner is Henry S. Griffin, New York City. Masonry, day labor.

F. Imber, 136½ Ferrier Ave., has the painting contract for $19,000 residence west side Russell Hill Rd., near Coulson Ave. Ed. H. Yeigh, 2 Bloor West, is the general contractor. A. A. Brayley, 75 Crescent Rd., is the owner.

Foundations are going in for $25,000 residence and garage north side Kilbarry Ave., near Warren Rd. Bayview Electric Co. have the contract for electrical work. Heating and plumbing by owner, G. Booth, 214 Heath St. Plastering and painting by day labor. Tiling to be let. Walter Oborne, 144 Glengrove Ave. E., is the general contractor.

The foundations are in for $10,000 residence and garage south side Rochester Ave., near St. Ives, for J. W. Scott, 576 Church St. Geo. A. Clark, 115 Glengrove Ave., is the general contractor; masonry—Thos. Roden, 51 Goodwood Ave. Tenders are being received by owner on electric, plumbing, heating, tiling, painting and plastering. J. Hunt Stanford & Son, 67 Yonge Arcade, are the architects.

Thos. Roden, 51 Goodwood Ave., has the contract for masonry, and John Sheard, 1908 Dufferin St., the plumbing contract, on $7,500 residence being built at 163 Alexandria Blvd. Tenders are being received by the owner and builder, Geo. A. Clark, 115 Glengrove Ave., on tiling, electric, painting and plastering.

J. D. Brown, 288 Davenport Rd., has the painting contract on $20,000 residence being built on Dunvegan Rd., for G. S. Homestead, care architect, J. Mitchell, 55 Isabella St. All trades to be let.

Foundations are going in for $12,000 residence and garage north side Laurence Crescent, near Mt. Pleasant Rd.; for F. C. Carter, 60 Victoria St. Ireland Bros., 11 Dinnick Crescent, are the builders. Masonry day labor.

Vancouver, B. C.

University Plumbing Co., Ltd., have the contract for plumbing and heating in connection with alterations for $270,000 apartment block on Georgia St. General contractors are Booker, Campbell & Whipple; architect, H. S. Griffith.

Windsor, Ont.

G. Campeau, 831 Wyandotte St. E., has the contract for electric work, and White Plumbing & Heating Co., the plumbing and heating, on $8,000 duplex residence being built on London St., lot 6, for J. H. Rodd, Sandwich, Ont. Plastering and painting to be let. Sam Keyser, 1312 Victoria Ave., is the general contractor.

White Plumbing & Heating Co. have the contract for plumbing and heating $8,500 duplex residence being built on London St., for J. H. Rodd, Sandwich, Ont. Sam Keyser, 1312 Victoria Ave., is the general contractor. Electric, plastering and painting to be let.

Winnipeg, Man.

Lount Engineering Co. have the general contract for $8,500 residence being built on Wolseley Ave. foot of Basswood, for Mrs. W. A. McKim, 1179 Wolseley Ave. General contractor buys materials and sub-lets trades.

Power Plants, Electricity and Telephones

Niagara Falls, Ont.

Queen Victoria Park Commission propose a lighting system at a cost of $20,-

SUPPLY BONDS
CITY OF TORONTO

If you have been awarded a supply contract by the City of Toronto, you will be asked to furnish a bond of a Surety Company.

These bonds are furnished at a very small cost and we can assure you of excellent service in looking after your requirements.

Call us and let us explain

MAIN 3476
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Established 1913

Special Toronto Representatives

Fidelity Insurance Co. of Canada

FIDELITY AGENCY OF CANADA LIMITED
THIRTY-SIX TORONTO STREET

WE WILL BOND
AND INSURE YOU
Contract Bonds,
Liability, Accident
Insurance

UNITED STATES FIDELITY & GUARANTY
Company
Total Assets .... $37,491,355.
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36 Toronto Street, Toronto
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Winnipeg .... Montreal
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General Manager
SIDNEY W. BAND
Asst. General Manager
W. R. KIRKPATRICK
Canadian Secretary

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

Specifications

A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff) made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steel."

Specification A-16-14 is, therefore, everything that a specification should be. It is a protection to the purchaser. It assures him of getting Rail Steel Bars, proven by over 3,000 tests to have a quality factor (strength and ductility) in excess of usual grades of steel. This specification at the same time prevents any substitution of undesirable re-rolled material.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal

You will be interested in the facts contained in this valuable book. A copy is yours for the asking.

Burlington Reinforcing Bars used in construction of Warehouse for Crane Limited, Toronto, erected 1922

Anglin-Norcross, Limited,
General Contractors

Wm. Steele & Sons,
Architects

Sturtevant

Successful Buildings

include a first-class, up-to-date Heating and Ventilating System. For not only does adequate heat and proper ventilation provide comfort and good health to the occupants, but it also assures longer life to the building with a minimum upkeep and repair expense.

Sturtevant Heating and Ventilating Systems have been installed and operated with distinctive success in practically all types of buildings. Folder 606, containing many interesting details, illustrations of equipment and buildings where installed, will be mailed without charge. Ask for your copy now.

B. F. Sturtevant Company
of Canada, Limited.

Montreal Galt Winnipeg Toronto

000. 2 batteries will be installed, 1 on table rock ledge and one on roof of Ontario Power Co. plant, to illuminate Niagara Falls. Work will start in the spring. Mr. Bond is the engineer in charge.

An addition to lighting system costing $30,000, on Niagara River Parkway from Administration Building to Dufferin Island, is being arranged by the Queen Victoria Park Commission.

Surrey, B. C.
B. C. Telephone Co, Ltd., of Vancouver, contemplate building a telephone exchange in Surrey Municipality, near Newton.

Toronto, Ont.
The walls are going up for $160,000 sub-station south east corner Danforth Ave. and Morton Rd., for Toronto Electric Commissioners. Roofing, painting and plastering trades to be let. General contractors are Jackson-Lewis Co., Ltd.

Verchers, Que.
South Shore Heat & Power Corp., contemplate extension to transmission line from Ste. Julie to Richelieu River. Work will probably go ahead next spring.

Weston, Ont.
The walls are going up for $40,000 telephone exchange being built here. F. G. Roberts & Co., 106 Wells St., have the contract for painting. Wells & Grey, Ltd, Toronto, are the general contractors.

CONTRACTS AWARDED

Godbout, Que.
St. Regis Paper Co. of Canada, Ltd., Montreal, Que., have awarded the general contract in connection with their $100,000 hydro electric development, to Canadian Comstock Co., Ltd., of Montreal. Contract includes installation of water wheels, generators, penstock, transmission lines, pumps, motors and electrical distributors.

Montreal, Que.
Laying of floors is now being done for $1,500,000 addition to telephone exchange, corner Ontario and St. Urbain Sts. Following sub-trades have been let: roofing — Douglas Bros. Co., Ltd.; plumbing, heating and ventilating—Garth & Co., Ltd.; ornamental iron—John Watson & Son, Ltd.

Miscellaneous

Chatham, Ont.
Additional contract for strengthening of wall and reconstruction of damaged portion, in connection with renewal of revetment wall costing $15,000, has been awarded to Wm. Bermingham, Kingston, Ont., at $3,300.

CONTRACTS AWARDED

Craven, Sask.
C. G. Anderson, Regina, Sask., has been awarded the contract for the erection of a dam here at $6,567.85.

Ingonish, N. S.
The contract for reconstruction of breakwater has been awarded to Thos. D. Morrison, D'Escouse, at $21,572.

KIRKFIELD
CRUSHED STONE and LIMESTONE DUST

New Address
THE CRUSHED STONE LIMITED
Harland Smith Building
53 Adelaide St. West
TORONTO

Elgin 1780
Elgin 1620

Audited, Verified Circulation!

is only
available on the National
Building and Engineering Paper:

Contract Record
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Thirty-Seven Years of
Continuous, Meritorious Service

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"WORLD" Hydrants and Valves have been the choice of engineers and municipal officials for nearly one hundred years. Today they are in service in every province in Canada and their numbers increase steadily.

Only products of exceptional merit could boast such a record.

"World" Hydrants are "right"—in design, in materials, in workmanship. Make them your choice and you'll never have cause to regret it.

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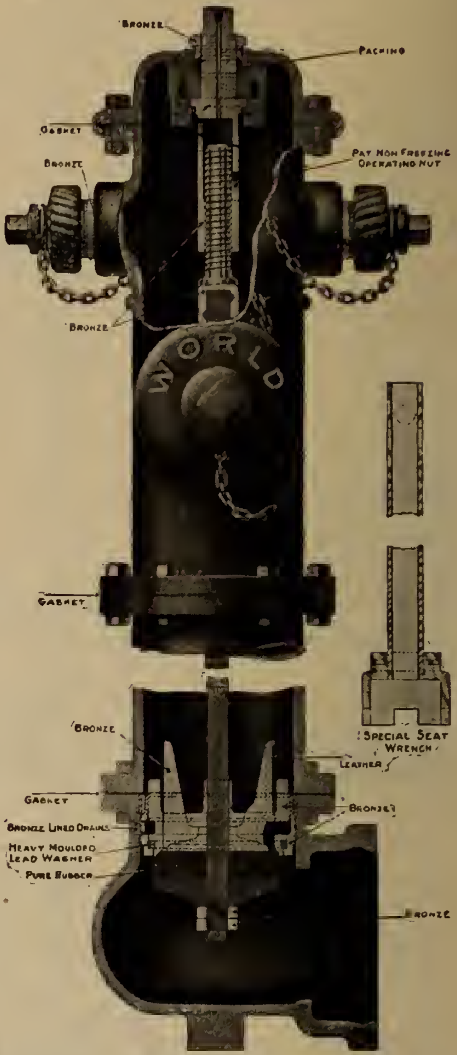

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Standard
Since 1834

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"Demand The Brand"

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Valves Fittings & Supplies

Goods Guaranteed Good BY Almost A Century's Experience ESTD. 1834

St. John, N.B. Canada.

Matthews Ave., one of the many smooth, dustless Tarvia streets in Point Grey, Vancouver, B. C.

Cypress St., Point Grey, Vancouver, B. C. This street, Tarvia since 1919, is in perfect condition today.

"We Couldn't Write a Better Advertisement for Tarvia"

UNDER the date of July 6th, 1923, Mr. W. B. Greig, Municipal Engineer of Point Grey, Vancouver, B. C., writes as follows:

> "The re-surfacing of Matthews Avenue between Angus Avenue and Cypress Street and of Cypress Street northerly from Matthews Avenue, was carried out in 1919 with 'Tarvia—X.'
>
> "The cost of the work did not exceed 80c per sq. yard, inclusive of all material and labor, and the results have been very satisfactory.
>
> "No maintenance repairs of any kind have been necessary to date."

We couldn't write a better advertisement for Tarvia than this.

And hundreds of other communities have found that Tarvia roads are the economical solution of the good roads problem — satisfactory alike to road officials and ratepayers.

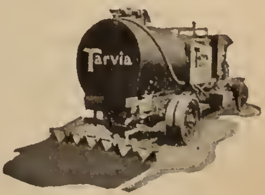
For Tarvia roads are not only firm, smooth, dustless and mudless all the year round—they are far less costly to build and maintain than any other type of modern highway. Because of these economies, the use of Tarvia insures the most miles of good roads that can possibly be built and maintained with the road funds available. There is a grade of Tarvia for every road purpose—new construction, repairs or maintenance.

Write to our nearest office for practical information regarding your road problem.

Tarvia

For Road Construction Repair and Maintenance

The Barrett Company
LIMITED
MONTREAL TORONTO WINNIPEG
VANCOUVER ST. JOHN, N. B. HALIFAX, N. S.



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Calumet 3697
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W. H. Noonan, B. Sc., Halifax
Adolphe Huot Limited, Quebec

Tenders

A few dollars spent in advertising your proposals in

The Contract Record

would result in additional competition which might save your city or town or your client many hundreds of dollars.

Washed Sand and Gravel
If You Build—Build Safely

Use clean, well graded sand and gravel of a superior quality.

A. W. ROBERTSON
Limited
Engineers and Contractors
Plant: Ivanhoe, Ont. Post Office, Telephone and Telegraph: Tweed, Ont.

New Roads From Old

The Wise Engineer makes the utmost of the old material in the road he is repairing and uses

The Austin Road Scarifier

to loosen the good stone before adding a bond of new surface material

This powerful Scarifier tears up the high or the uneven road surface to a depth of from two to four inches, and loosens effectively the low parts or "potholes," as well. This reduces the irregularities to an even bed on which to roll and form the new crust—the new stone bonding with the old perfectly, in a most economical manner.

Our nearest branch will gladly mail you valuable and interesting Austin road-building facts and costs of equipment.

THE **Canadian FAIRBANKS-MORSE Co.,** LIMITED
St. John Quebec Montreal Ottawa Toronto Windsor Winnipeg Regina
Calgary Vancouver Victoria

149

For Permanent Construction
Use
Pressure Creosoted Wooden Materials

PILING
POLES
CROSS-ARMS
FENCE POSTS
PAVING BLOCKS
"BLOXONEND" FLOORS
STORM SEWERS
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MINE TIMBERS
HOT HOUSE LUMBER

If you could be assured of an annual saving of 50% to 80% in cost of maintenance, would it not be worth while to ask us to furnish you with authentic data as to the relative longevity of pressure treated and untreated materials?

Our Engineering Department is at your service.

Practise conservation that really conserves.

CREOSOTED PRODUCTS Ltd.
C.P.R. Building
Toronto, Ont.
Phone: Adel. 3604

For Road Building and Construction Work

Select your requirements
in Crushed Stone, Gravel
Lime, Cement, Sand, Etc,
—from—

BRITNELL & COMPANY, LIMITED
C.P.R. Crossing Yonge Street North Toronto
Day Phone, North 664 Night Phone, North 2107

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M	28.50	25.00	32.00	
Enamelled brick	per M	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	68-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.60 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.75 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.80
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were advanced recently. New list may be had on application to dealers.
VITRIFIED CLAY PRODUCTS:—Discount on flue linings is 55%

DAKE MACHINERY

Compact—Simple—Reliable

Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.

Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.

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Capt. Wm. Stitt, Can. Sales Mgr.

In Stock

STEAM SHOVELS

Revolving and Railroad Type

LOCOMOTIVES

Standard, 36″ and 24″ Gauge

CARS

Ballast; 20 yard; 6 yard; 4 yard;
3 yard; and 2 yard

DERRICKS, HOISTING ENGINES
AIR COMPRESSORS, RAILS

Eastern Equipment Co.
Limited

MONTREAL, QUE. DORVAL, QUE.
P. O. Box 792

RAILS

New 12 to 105 lb. complete with Fastenings, Bolts, Spikes, Switches, Tie Plates and etc.

Relaying Rail, 20 to 100 lbs.

John J. Gartshore Limited

58 Front St. West, Toronto

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Russell Construction

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Engineers and Contractors

Harbor Administration Building
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Buildings, Bridges,
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Specialists in

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"On our Terminal job we poured about 30,000 yards of concrete. Our Clyde derrick kept our hoppers supplied at all times at a considerable saving and never caused us a moment's delay. JACOBSON BROS., Duluth."

Every unit of the CLYDE line of Hoisting equipment is built to fixed quality standards and is covered by rigid guarantees against original defects. Write for information.

You'll take pride in your CLYDE!

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Sole Distributors for Clyde Iron Works

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—	Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir ....per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir ....per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine ....per M.	75.00	80.00		
Flooring, No. 1 Spruce ....per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear ....per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear ....per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir ...per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine ....per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough ....per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough per M.	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in. ....per M.	41/45	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S ....per M.	45/60	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in. ....per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up ....per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine ....per M.	13.50	12.00	11.20	
Lath, M. R. spruce ....per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar ....per M.	6.00	5.00	5.60	3.25
XX B.C. cedar ....per M.	4.50	4.25	3.20	1.90
N.B. extras ....per M.	6.50	6.75		
N.B. clears ....per M.	6.00	5.50		
Pine casing ....per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing ....per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—				
White lead ground in oil, less than ton lots ....per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots ....per cwt.	17.00	9.55	22.00	16.00
Putty in bulk ....per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk ....per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls. ....per gal.	1.20	1.40	1.30	1.46
Raw linseed oil, in bbls. ....per gal.	1.17	1.38	1.33	1.43
Turpentine, in bbls. ....per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls. ....per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls. ....per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—				
Hard wall plaster, sanded ....per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots ....per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair ....per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—				
Bricklayers ....per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers ....per hr.	.85	.50–.75	.90	1.00
Plasterers ....per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers ....per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers ....per hr.	.90	.60–.75	1.00	.90
Carpenters ....per hr.	.90	.65	.85	.81¼
Painters ....per hr.	.75	.55–.65	.75	81¼
Electrical Workers ....per hr.	.80	.65	.65- .85	1.00
Roofers ....per hr.	.65	.65	.50	.90
Laborers (Common) ....per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled) ....per hr.	.60-.70			.90
Sheet Metal Workers ....per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.

Wire Brompton Your Interior Finish Needs

And don't be afraid to mark your order "RUSH".
We have all the facilities for making immediate delivery, no matter what size your next order.
Try us on a mixed carload.

HARDWOOD FLOORING OUR SPECIALTY.

Brompton Lumber & Mfg. Co. **Bromptonville, Quebec**

THE HAGERSVILLE CRUSHED STONE Co.

Crushed stone from our quarries is hard and durable, giving lasting service with least upkeep costs. Does not deteriorate with exposure to weather and does not cost any more than softer stone. Approximate weight 2400 lbs. to cubic yard, which means a big saving in freight over gravel products.

Capacity of Plant: 25 Cars Per Day

Prompt shipment. Delivery on all steam and electric railways. Your orders solicited.

Phone 19, Office: MAIN ST., HAGERSVILLE, Robt. Hambleton, Mgr.

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

Canada Crushed Stone Corporation Limited

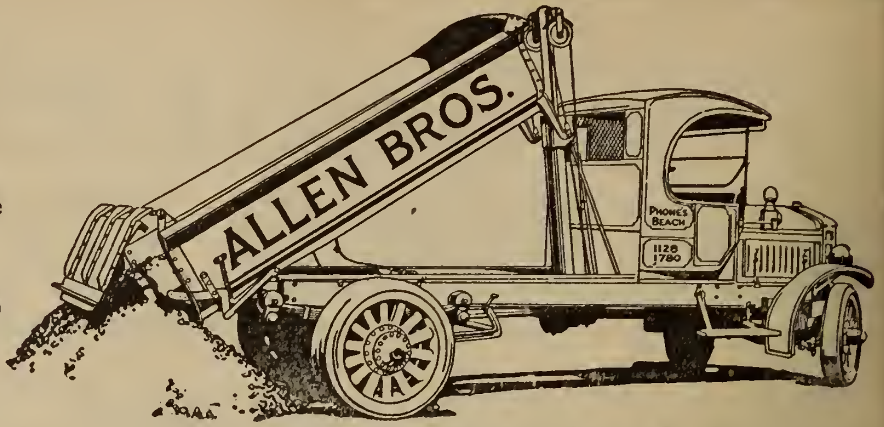
DUNDAS ONTARIO

Exclusive Agents:—John E. Russell Co., Ltd. Phone Adelaide 1600

SCREEN GRAVEL
PEA GRAVEL
SAND

Rapid Truck Delivery. Just Phone
Beach 1128 or 1780

ALLEN BROTHERS
STOP 19, KINGSTON ROAD
TORONTO, ONT.



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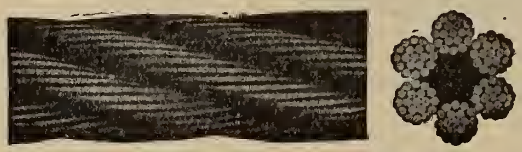
SAND & GRAVEL CO. LTD.

WASHED SAND and GRAVEL
WASHED CONCRETE SAND
CONCRETE PRODUCTS

33 ADELAIDE ST. W., TORONTO, ONT.
Phones: Office, Adel. 4936 Nights, Ger. 4049M

Wire Rope and Fittings



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Wire rope stocks carried in Montreal, Calgary and Edmonton
Agents: J. H. Hanson, Co. Ltd., Montreal
N. F. Judah, McLeod Bldg., Edmonton

Install the Tank With the Most Advantages

THE steel tank provides the only safe source of water supply for fire protection purposes.

A tank that may burn reduces by a considerable margin the degree of safety inherent in a fire protection system. A tank that may burst due to deteriorated hoops or rotted staves may put a sprinkler system out of service at the critical moment of fire against which a fire protection system may have been maintained for years. A tank which leaks results in a continual expense and may reduce the available water storage at critical times.

To all of these difficulties in the way of reliable fire protection, the Horton steel tank is the logical solution.

The Horton steel tank cannot burn; it cannot rot; it is scientifically designed with proper factors of safety to prevent any chance of failure; it will not leak; and it provides a dependable supply of water depending on the force of gravity alone to make it instantly available in case of fire.

Horton Steel Works Ltd.
BRIDGEBURG, ONT. MONTREAL, QUE.
106 Janet Street 1005 Bank of Toronto Bldg.

CRUSHED STONE LIME SAND

STANDARD LIME COMPANY LIMITED
JOLIETTE, QUE.
LARGEST PRODUCERS OF LIME IN CANADA

PLANTS
CRUSHED STONE
JOLIETTE, QUE.
C.N.R. & C.P.R.

LIME
JOLLIETTE and ST. MARC, QUE.
C.N.R. & C.P.R.

SAND
ST. FELIX DE VALOIS, QUE.
C.P.R.

AN INDUSTRIAL CRANE

Cannot be exceeded in the number of jobs it will do

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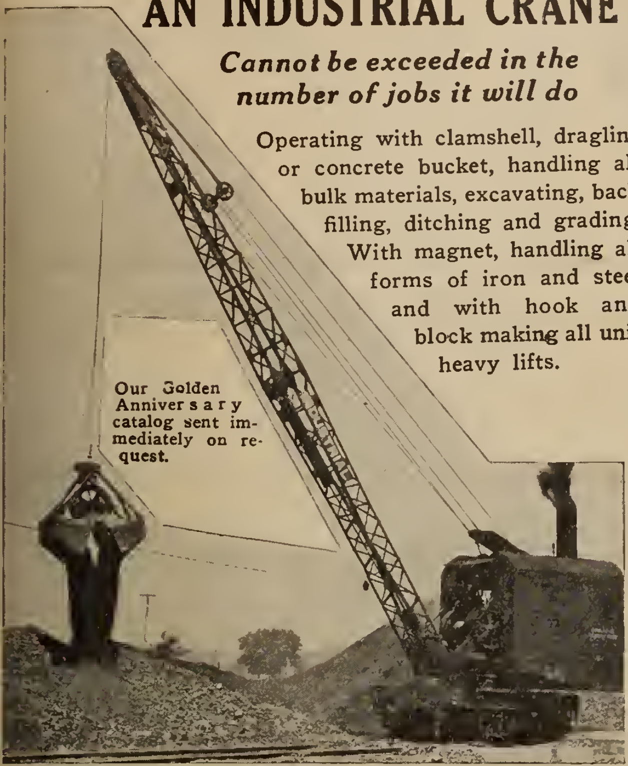

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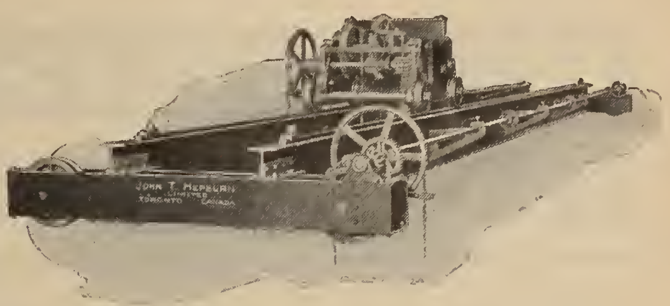

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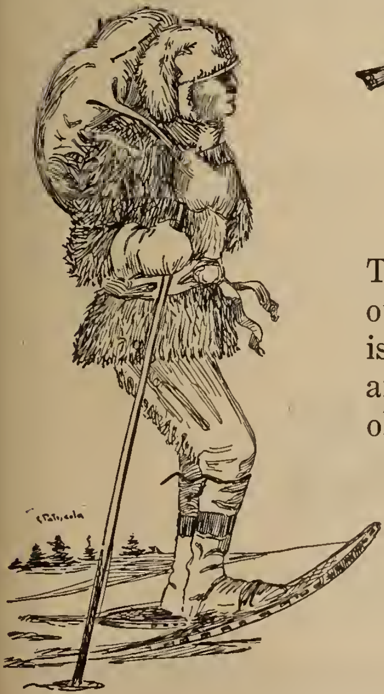
An' he'll say to you w'at he say to me,
  So lissen hees story well—
"I see de track of hees botte sau-vage
  On many a hill an' long portage
Far far away from hees own village
  An' soun' of de parish bell—"



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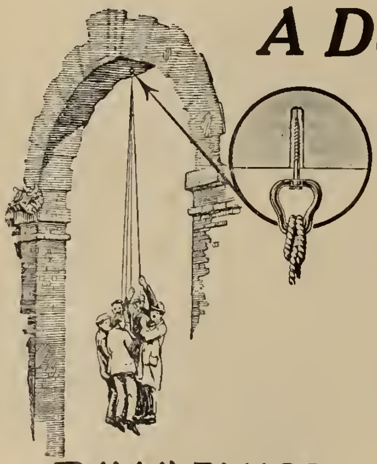

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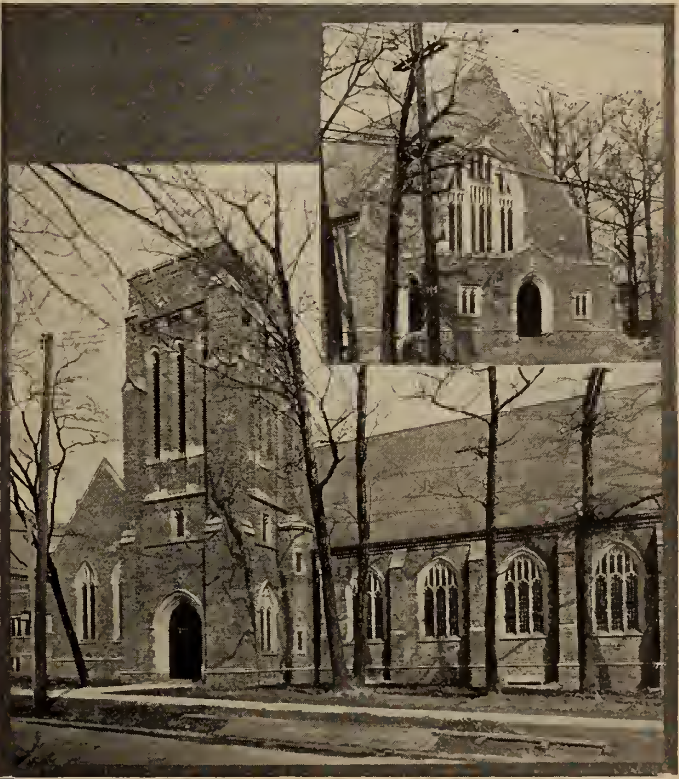

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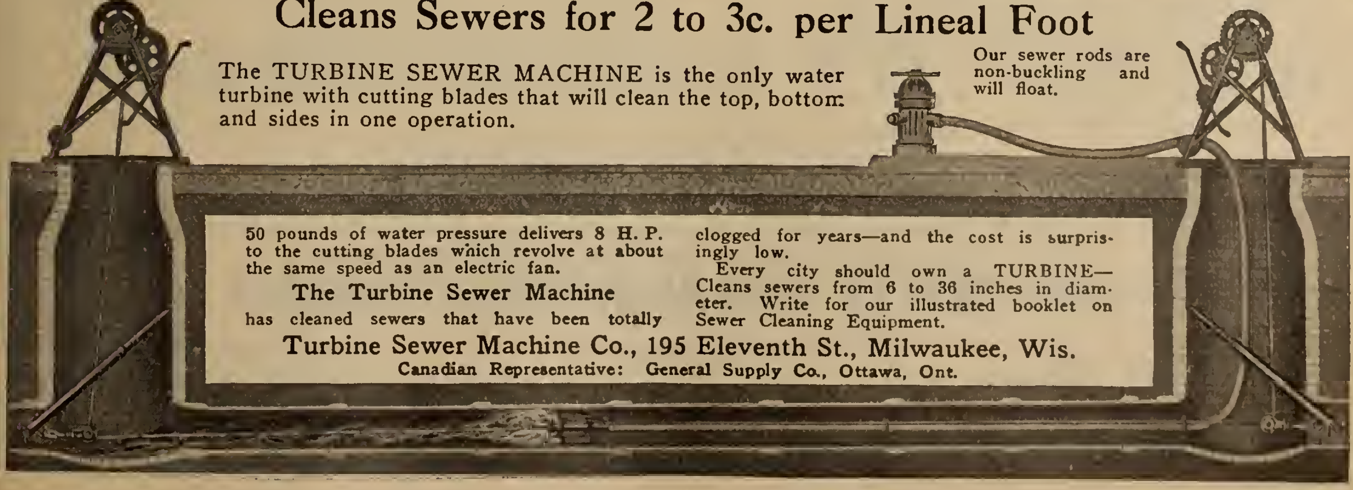

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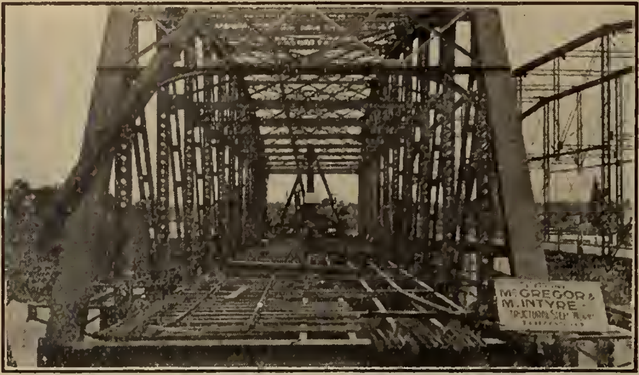

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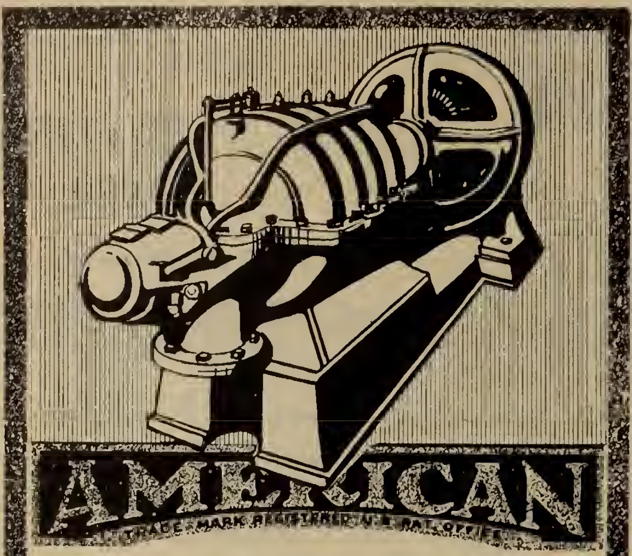
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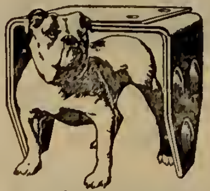

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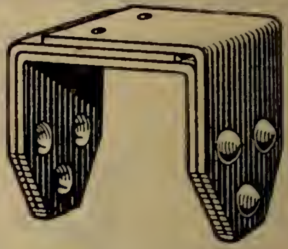

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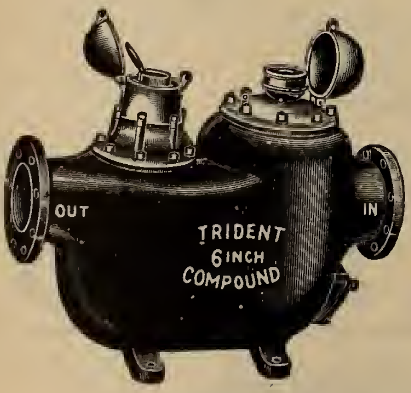

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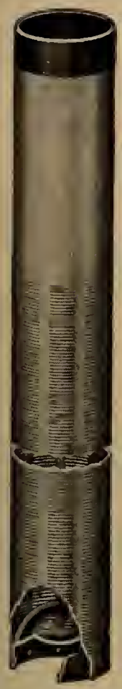

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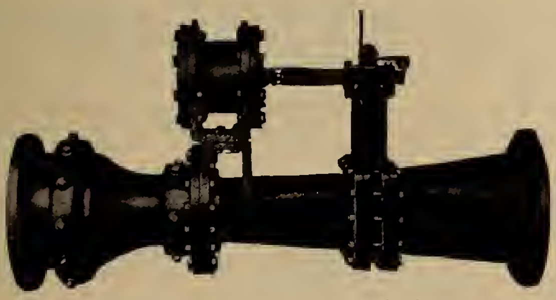

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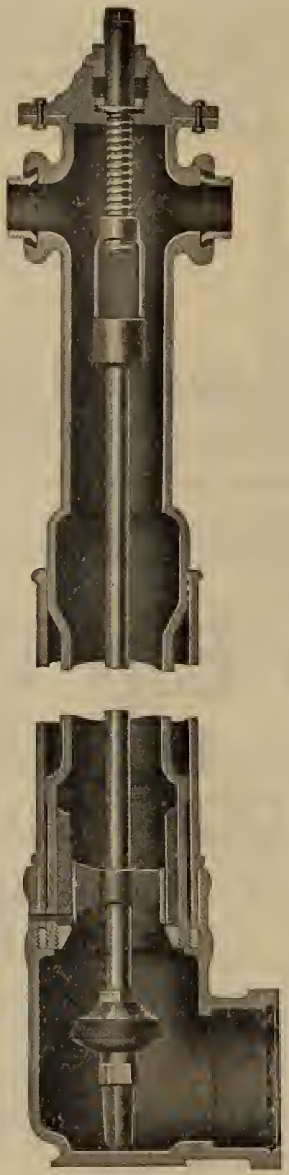

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"Estimating Building Costs," by Charles F. Dingman, first edition, published by McGraw-Hill Book Company, Incorporated. 240 pages. Price $2.50.

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"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Reinforced Concrete Construction", Volume 1, by George A. Hool, S. B. Second edition, published in 1917, 254 pages, illustrated. Price $2.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $1.00.

"Sheet-Metal Pattern Drafting and Shop Problems." by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

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"Practical Accounting for General Contractors"—by H. D. Grant. Published in 1922 by McGraw-Hill Book Company Incorporated, 254 pages. Price $3.00.

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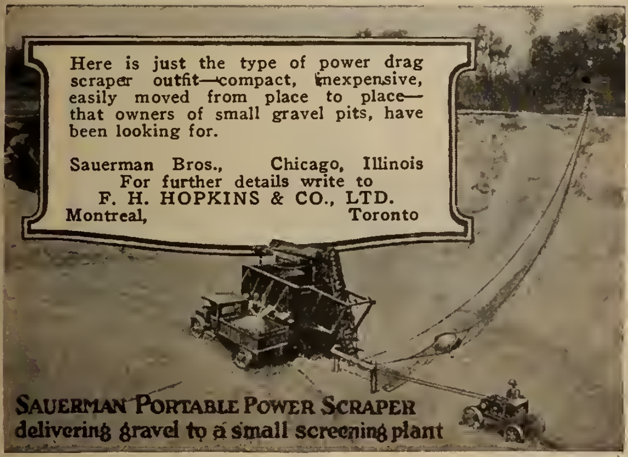
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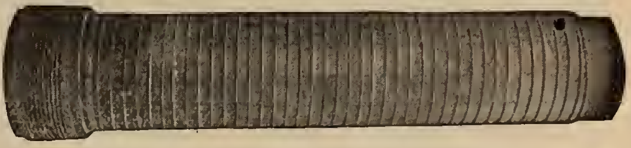

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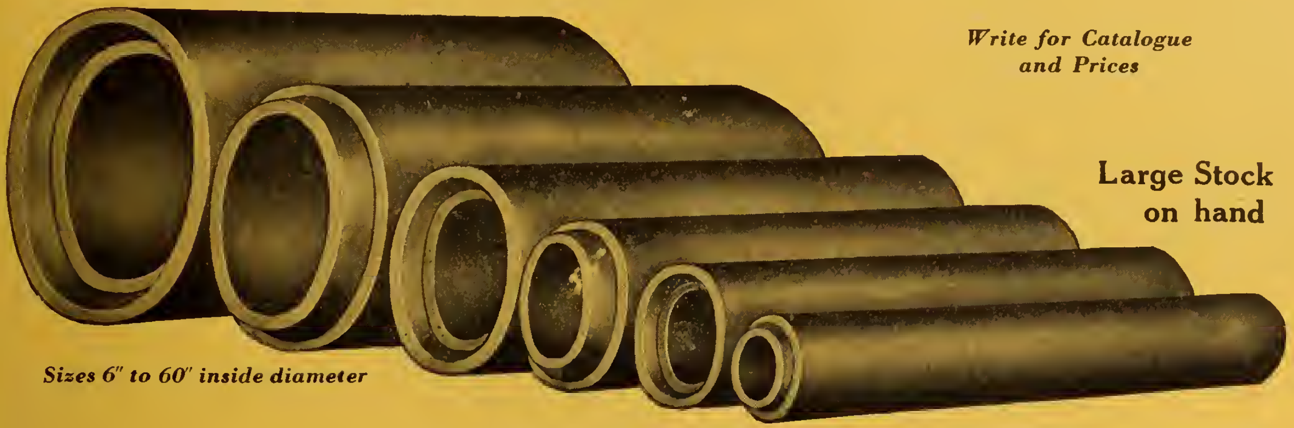

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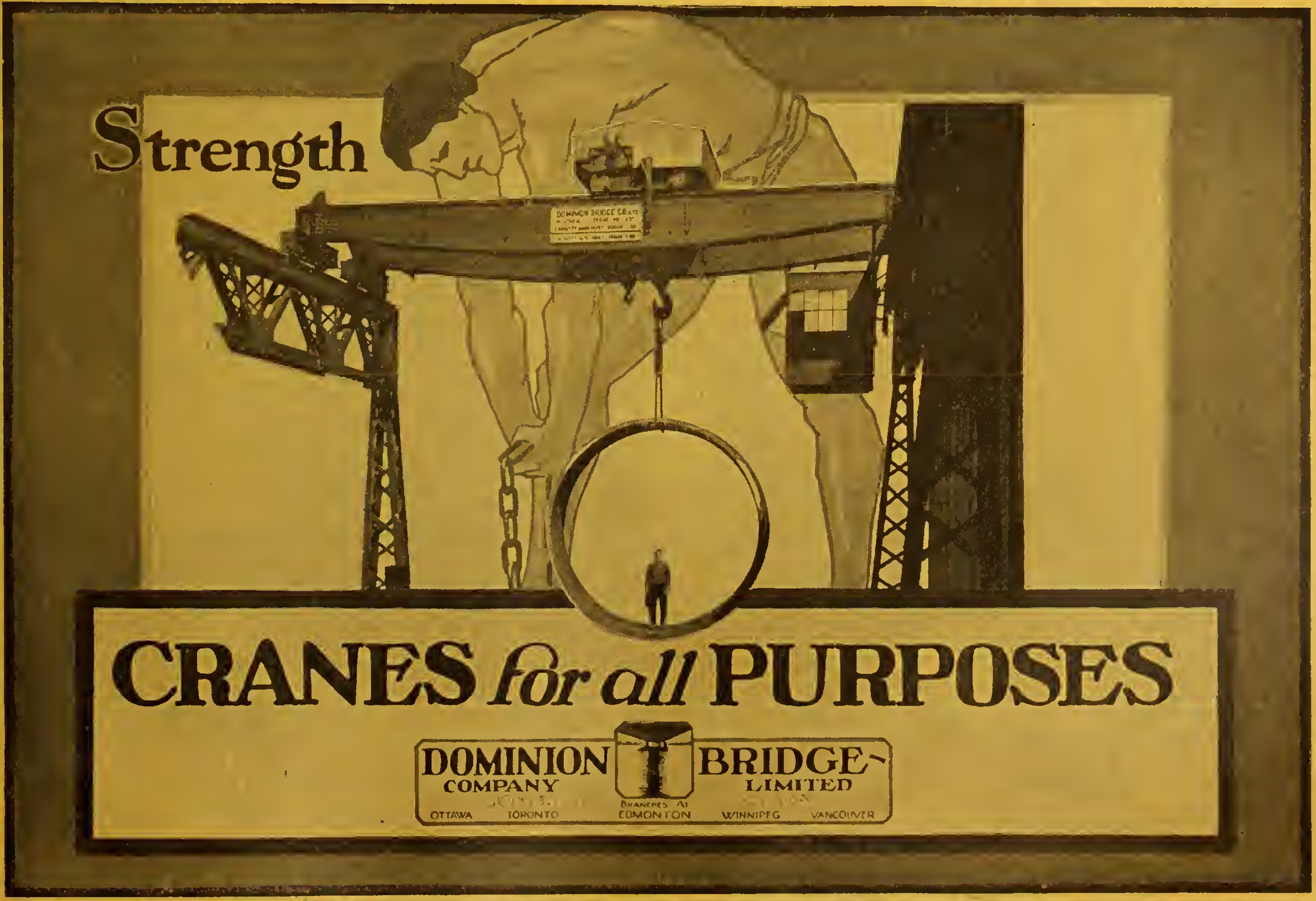

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Vol. 37 Toronto, December 12, 1923 No. 50

Contract Record and Engineering Review

Caledonia Road
Hamilton—

When the Ontario Department of Highways planned the Provincial Highway System, they decided on Hamilton as the chief centre of these Highways in Southern Ontario. Most of the highways radiating from Hamilton were completed last year. The Caledonia Road however, was one of the two left for completion in 1923.

The Caledonia Road runs south from the top of the Incline Railway and carries a large amount of milk traffic daily to Hamilton as well as bus services from Hamilton to Caledonia, Hagersville, Port Dover, Cayuga and other points. In constructing this road of Hot-Mix Asphalt over a macadam base, the Department has again shown their confidence in this type of road for all kinds of traffic. This 6½ miles of highway was built by the Hamilton Contracting Company Limited who used Imperial Asphalt throughout.

ROAD ENGINEERING DEPARTMENT

Toronto **Imperial Oil Limited** Canada

IMPERIAL Asphalt PRODUCTS

Three views on the Caledonia Road, Hamilton. The centre picture taken at the top of the "Mountain" looking towards Hamilton.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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Steel
Double-Coupling
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DURABILITY!

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secures permanency
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Wire Wound or Continuous Stave

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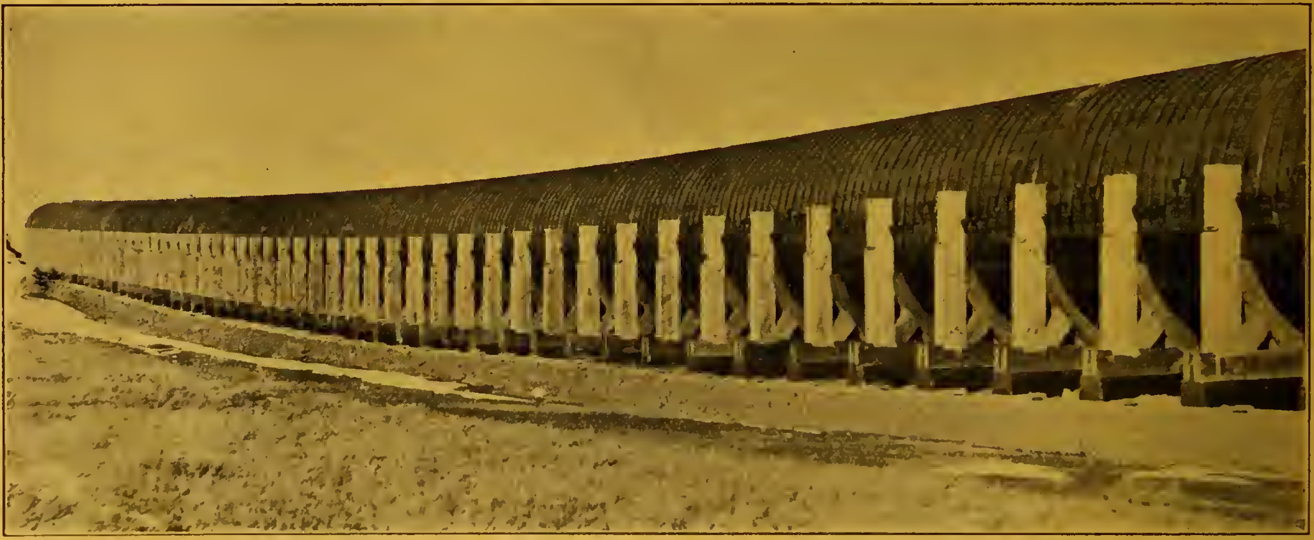

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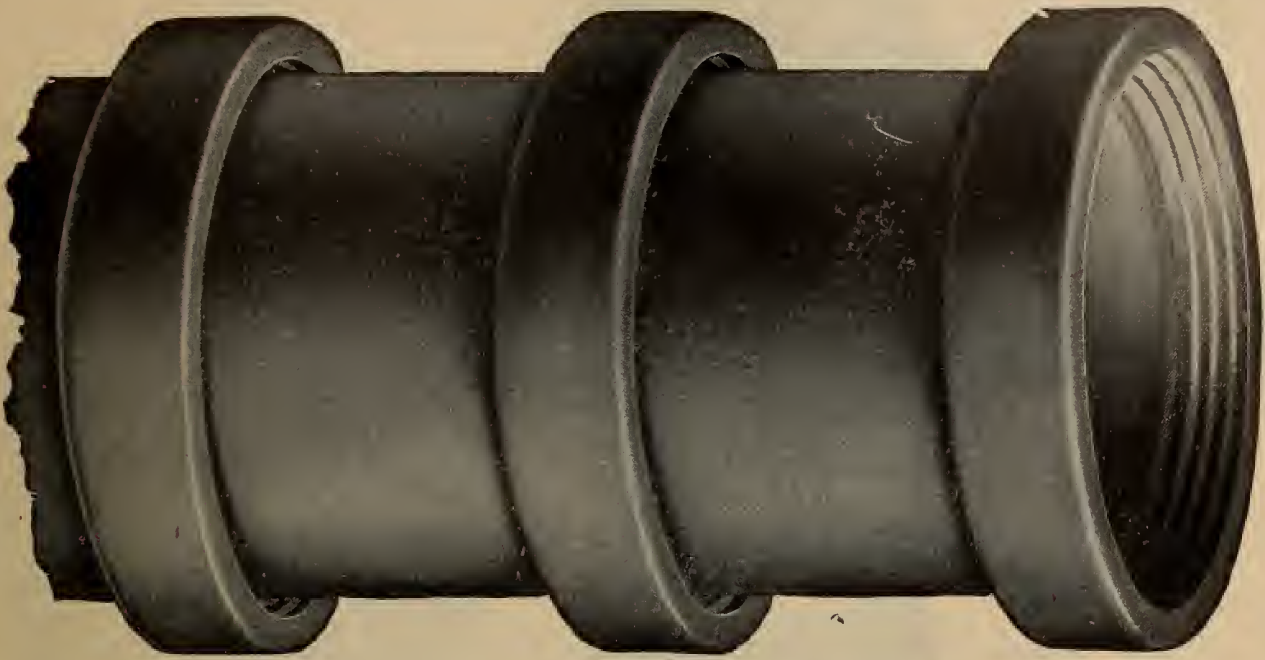

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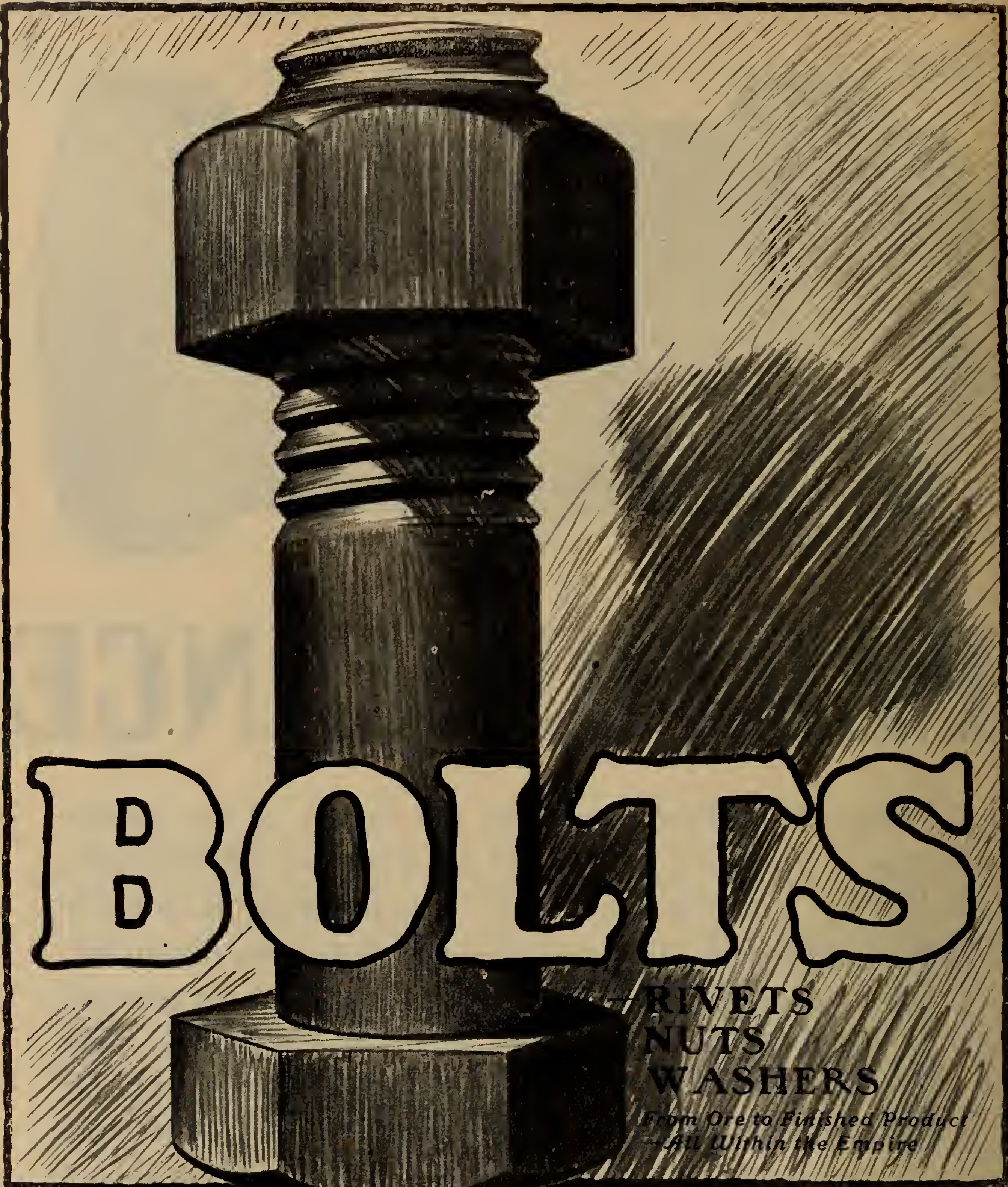

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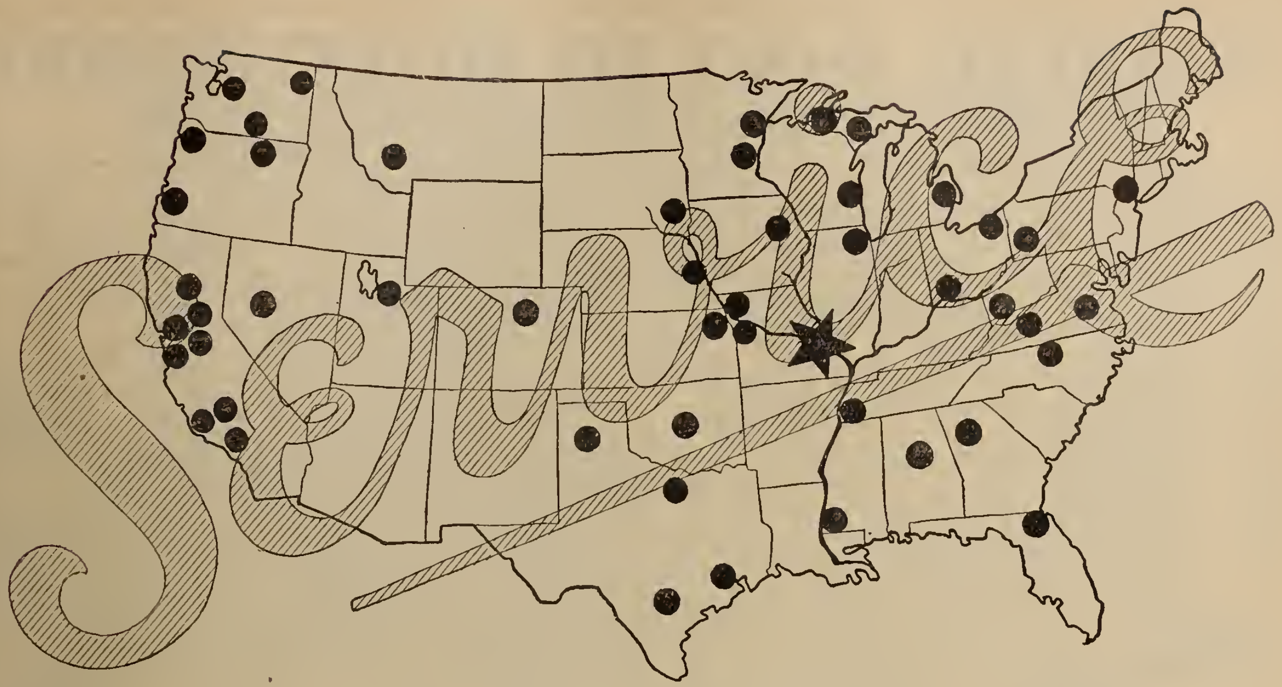

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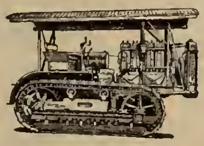

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  - Standard Lime Co.
- Crushers (Stone and Rock)
  - Canadian Ingersoll Rand Co.
  - Hopkins & Co., Ltd., F. H.
  - Inglis Co., John
  - Jeffrey Manufacturing Co.
  - London Concrete Machry. Co.
  - Mussens Limited
  - Rogers Supply Co.
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  - Oakley & Sons, Geo.
  - Ritchie Cut Stone Co.
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  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Turnbull & Co., Harvard
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  - Buckeye Traction Ditcher Co.
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  - F. H. Hopkins & Co., Ltd.
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- Dredges
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  - MacKinnon Steel Company
  - Mussens Limited
- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

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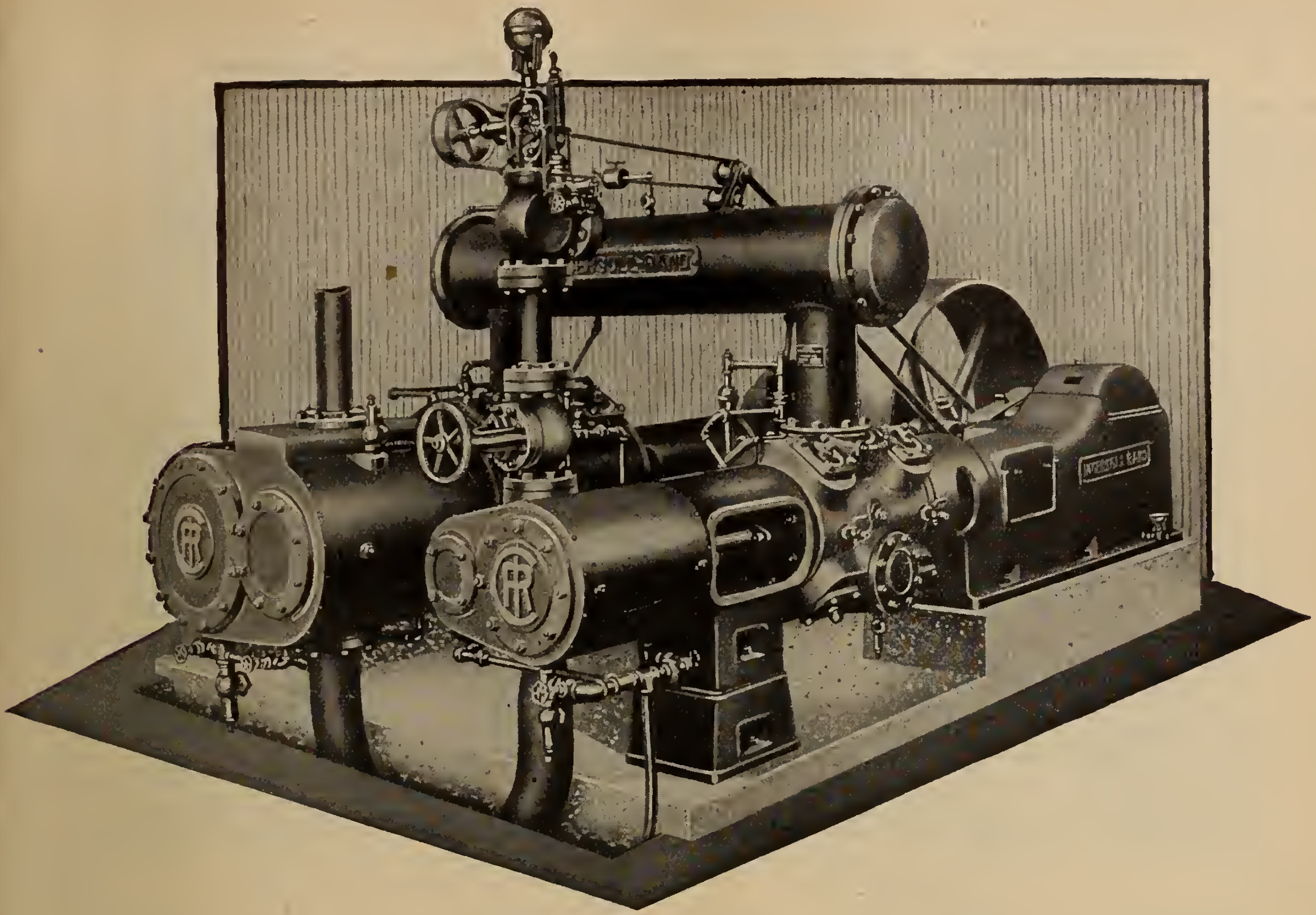

A New and More Efficient Compressor

To meet the demand for a high-class Steam-driven Compressor of larger capacity than our Class "FR-1" Straight-line type, we have designed the Class "PRS" Duplex Steam-driven Unit shown above.

These machines are of the enclosed dust-proof construction which characterizes our famous Class "PRB" and "PRE" Belt and Motor-driven Compressors. Frames, running parts, lubrication system and plate valve air ends are identical with those used on corresponding sizes of our belt and motor-driven units.

The steam ends are either simple or compounded as desired and are equipped with Ingersoll-Rand Balanced Piston Steam Valves. These valves are similar to those used on modern locomotives and permit the efficient use of super-heated steam as well as the low pressures common in the past. They require less power to operate and have much longer life than any other types.

Speed and Pressure Governing Devices or a combination of Speed and Pressure Governor and our Free Air Unloader can be furnished as desired.

Class "PRS" Compressors provide a simple, efficient and thoroughly reliable unit particularly adapted for mines, construction jobs or industrial plants where steam is used. They are readily converted to power drive when desired and are therefore well suited for use in localities where hydro-electric plants are under construction or where a combination of steam and motor drive is desirable.

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Sturtevant, B. F. & Co.

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Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

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Otis-Fensom Elevator Co.
Turnbull Elevator Company

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Hopkins & Co., Ltd., F. H.
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Laurie & Lamb
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Lorne Tractors
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Waterous Engine Works Co.

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Milton Hersey Company
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Canadian Mead-Morrison Co.
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Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
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McGovern, T. J.
Mussens Limited
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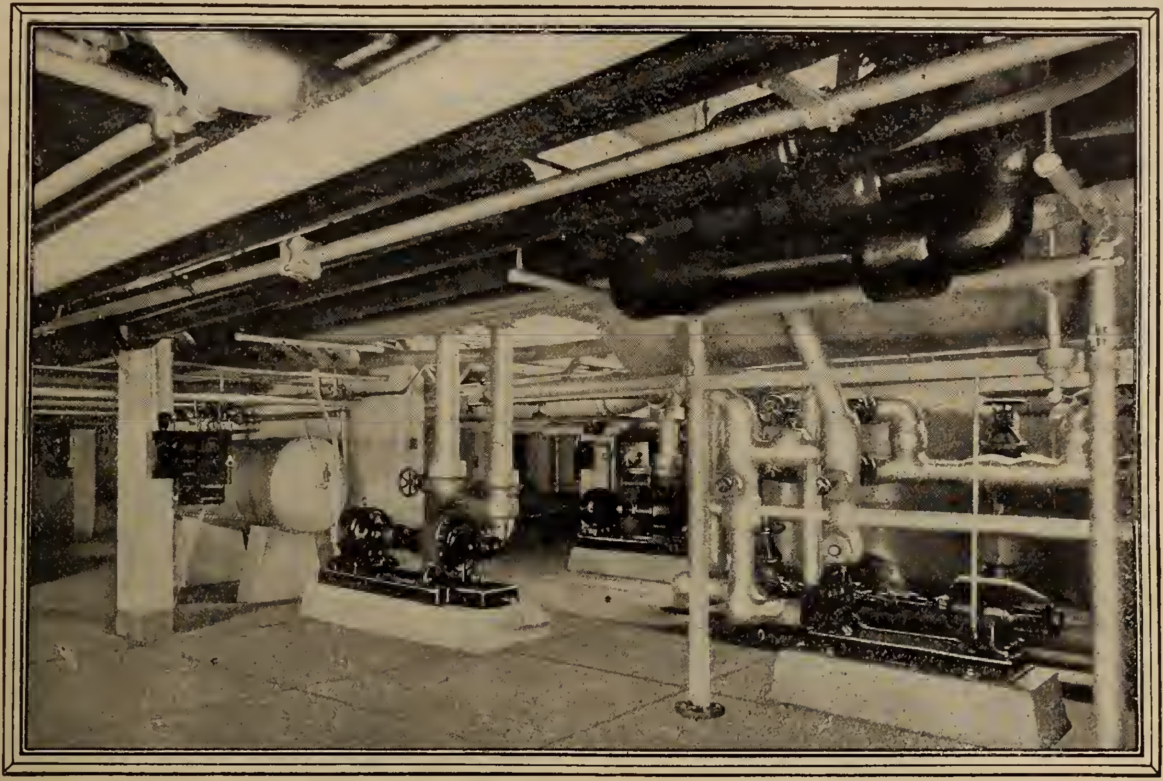

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BROAD EXPERIENCE SIMPLIFIES PROBLEMS

Many of your perplexing problems in plant engineering have been met and solved, perhaps, in other installations. As the medium through which much of this development is carried out, Crane Ltd. has acquired valuable experience and skill in the planning and producing of piping equipment of every description. Crane engineers are further aided by intensive research, in the design and manufacture of valves, fittings and specialties to make the most efficient systems for every piping need of water, steam, gas, oil or air.

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Greening Wire Co.. B.

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Greening Wire Co., B.
Hopkins, & Co. Ltd., F. H.
Mussens Limited
Canadian Pipe Company
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Wood Preservations
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Woodworking Mach'y (Combination
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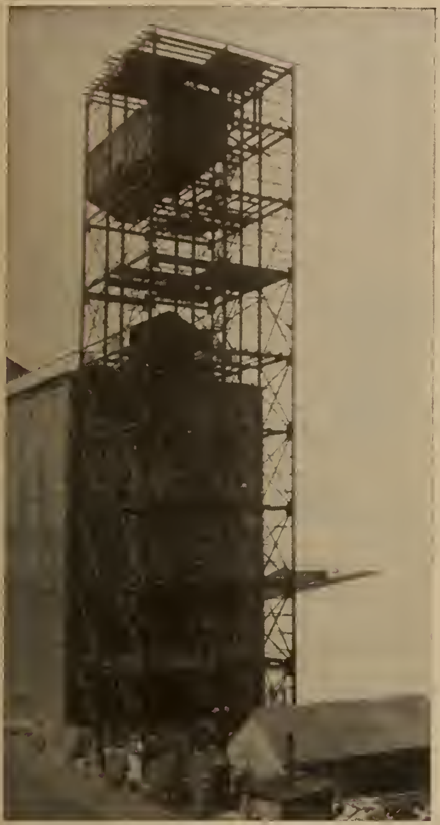

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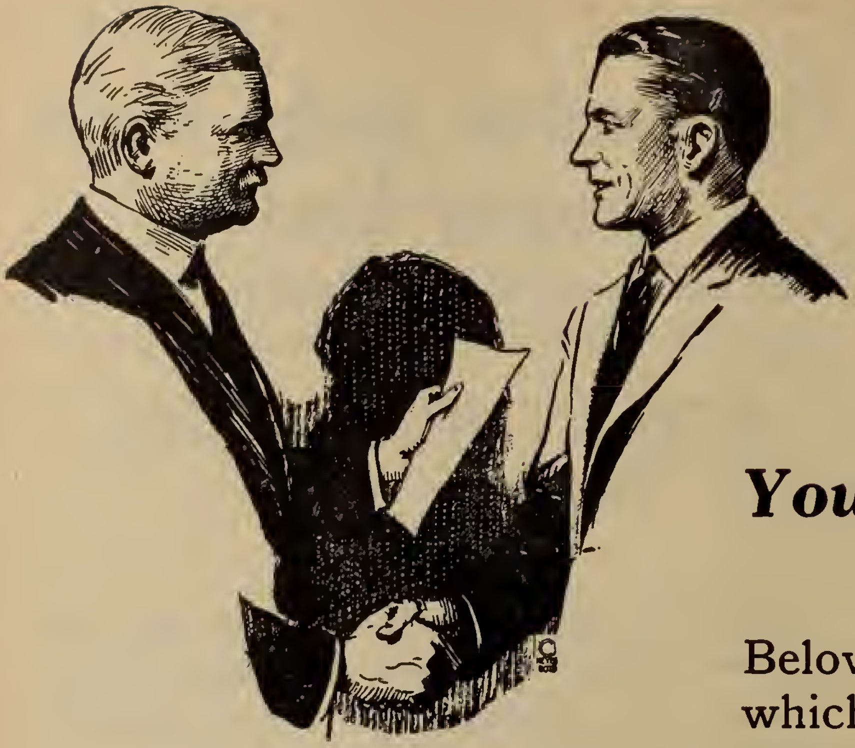


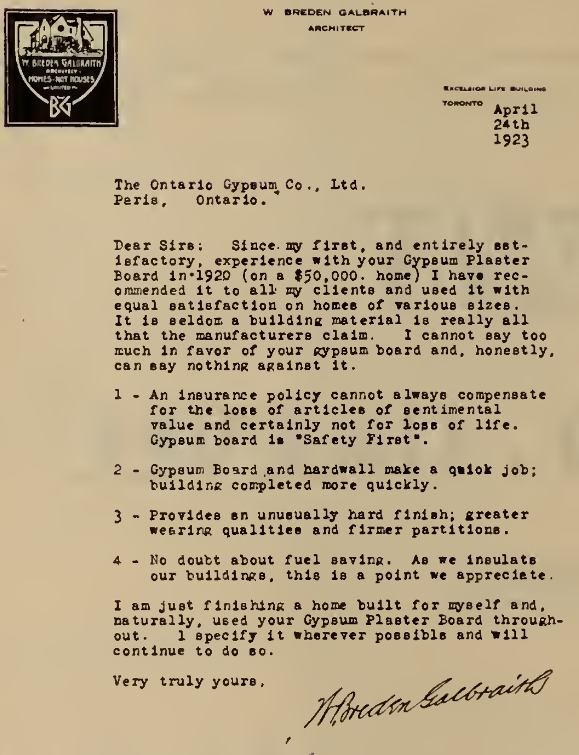
Your friend - - the Architect

Below, we reproduce a letter which should be read by every dealer of building supplies in Canada.

Because it expresses the attitude not only of the writer but of the profession as a whole.

Do you catch the significance of it? Do you see how the architect becomes a salesman for the dealer who handles Gypsum Products?

Do you want some of this profitable business? Then write us today, and we shall be pleased to forward you the full facts.



W. BREDEN GALBRAITH
ARCHITECT

EXCELSIOR LIFE BUILDING
TORONTO April 24th 1923

The Ontario Gypsum Co., Ltd.
Paris, Ontario.

Dear Sirs: Since my first, and entirely satisfactory, experience with your Gypsum Plaster Board in 1920 (on a $50,000. home) I have recommended it to all my clients and used it with equal satisfaction on homes of various sizes. It is seldom a building material is really all that the manufacturers claim. I cannot say too much in favor of your gypsum board and, honestly, can say nothing against it.

1 - An insurance policy cannot always compensate for the loss of articles of sentimental value and certainly not for loss of life. Gypsum board is "Safety First".

2 - Gypsum Board and hardwall make a quick job; building completed more quickly.

3 - Provides an unusually hard finish; greater wearing qualities and firmer partitions.

4 - No doubt about fuel saving. As we insulate our buildings, this is a point we appreciate.

I am just finishing a home built for myself and, naturally, used your Gypsum Plaster Board throughout. I specify it wherever possible and will continue to do so.

Very truly yours,

W. Breden Galbraith

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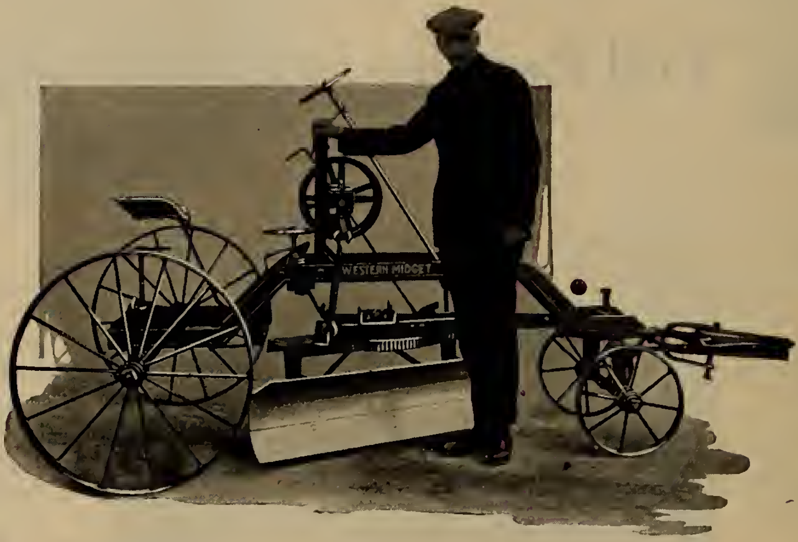

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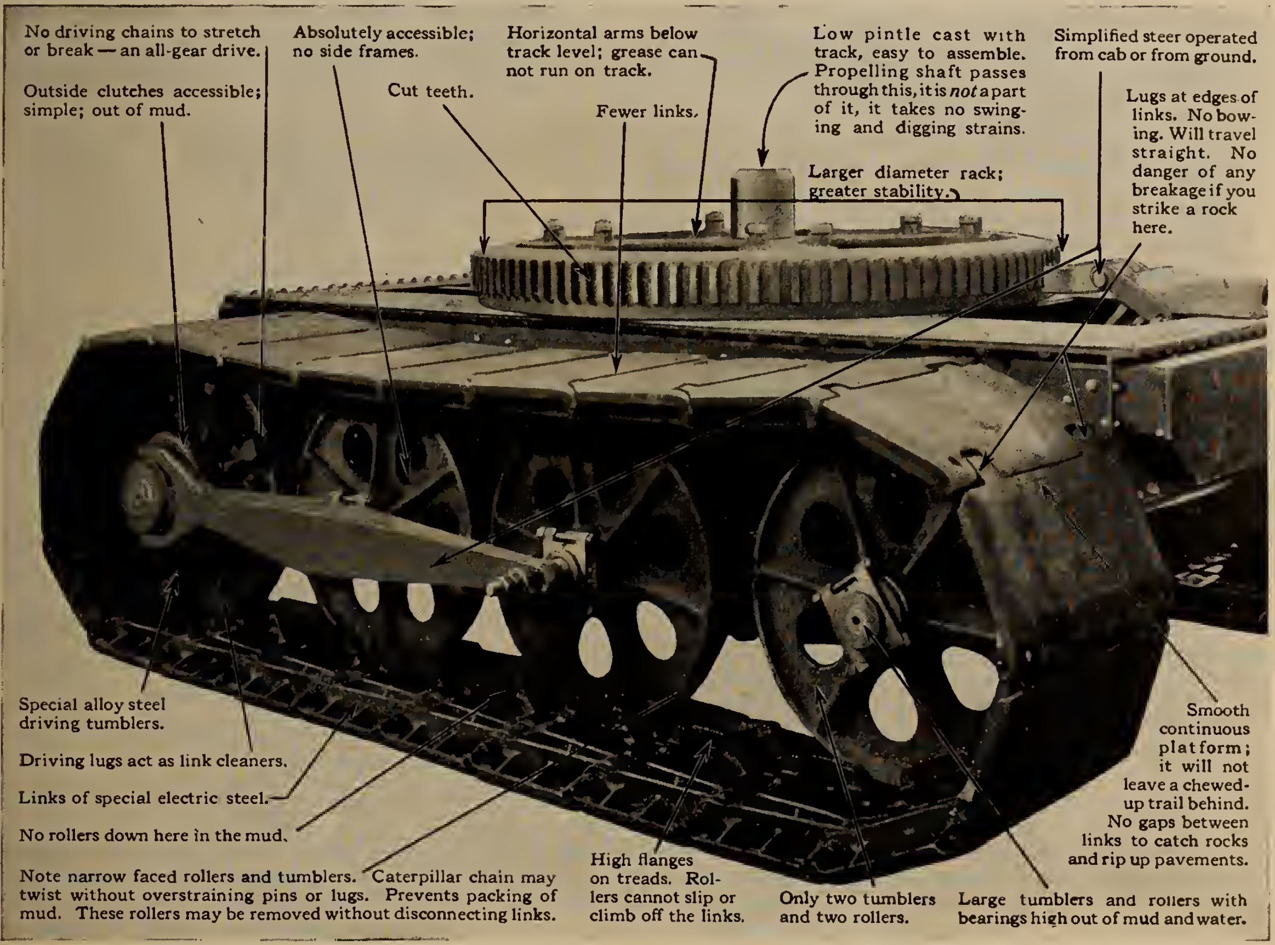

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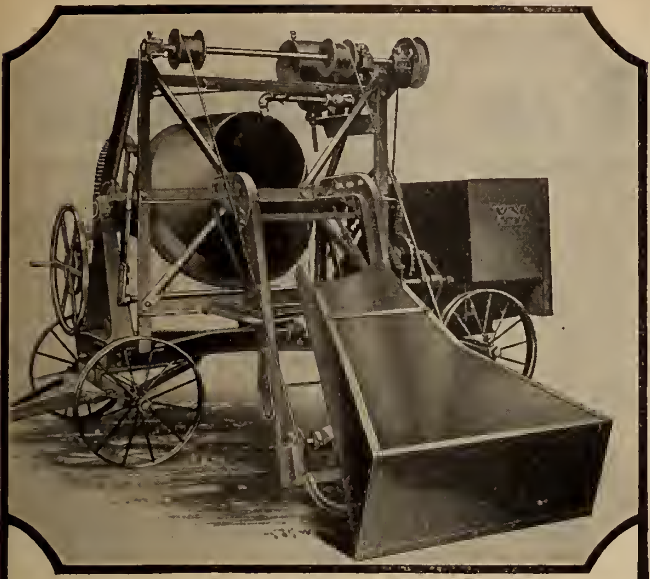

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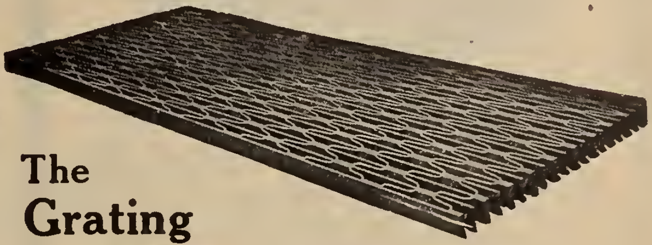

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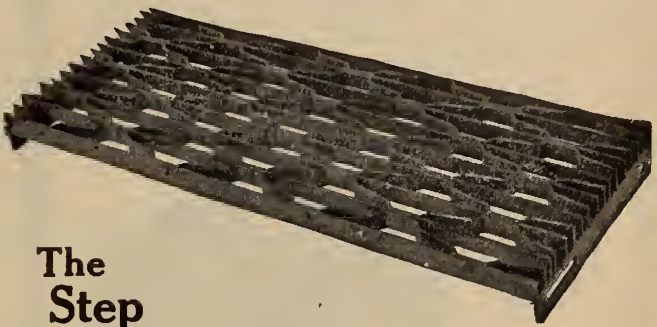

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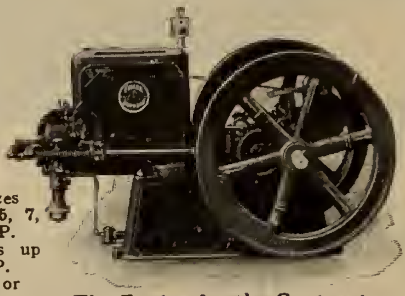

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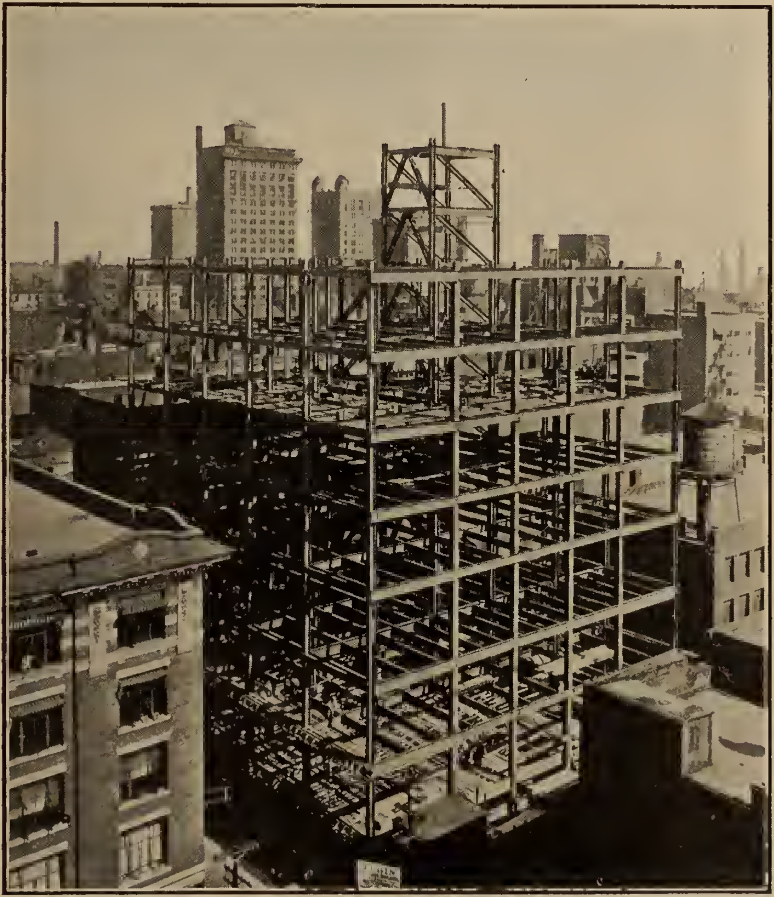

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View of Natco Enclosure Wall Tile under construction. Note particularly how easily and efficiently the Face brick are bonded to the wall.

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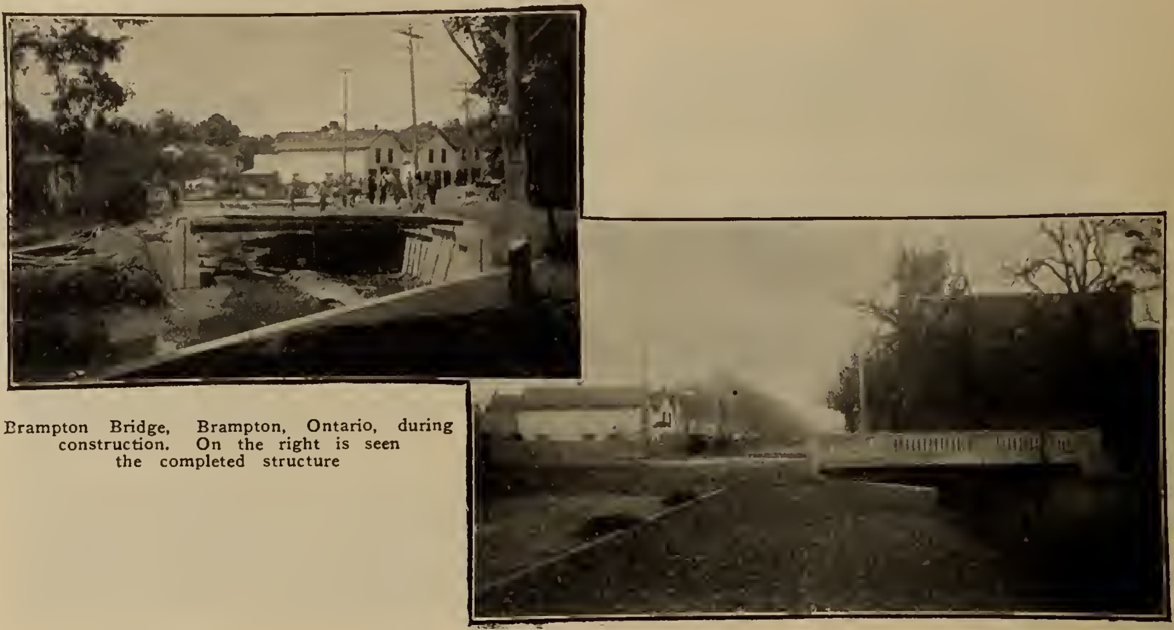

Brampton Bridge, Brampton, Ontario, during construction. On the right is seen the completed structure

NEW CONCRETE BRIDGE AT BRAMPTON, ONT.

The new Brampton Bridge performs double duty for the citizens of Brampton. Formerly the main street branched into two bridges but with the building of this concrete bridge, the stream was diverted and necessary filling in done, so that now, one structure covers the junction of the roads as shown in the pictures.

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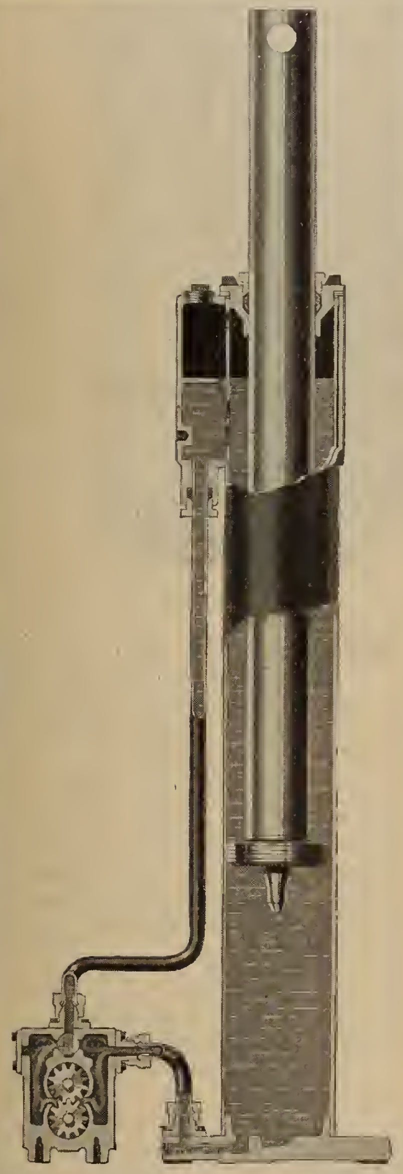

Wood-Canada *Hydraulic* Hoist
Note the simplicity of the hydraulic construction—the absence of bevel gears, chains, sprockets, worm and worm wheels, screw and nuts, thrust bearings, knockout gearing and other mechanism liable to friction and breakdown—no moving parts except a piston and two gears *operating in oil.*

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Contract Record and Engineering Review

Devoted to Construction and Engineering

Vol. 37 Toronto, December 12, 1923 No. 50

Estimating the Cost of Fireproof Construction

Practical Data That Will Enable the Contractor to Figure on Hollow Tile, Gypsum or Concrete and Tile Fireproofing

By CHAS. F. DINGMAN

(Copyright, 1923, by Chas. F. Dingman)

Fireproof construction, or more properly speaking, fire-resistive construction, divides itself into three general types: terra-cotta, gypsum and concrete.

Brickwork is, of course, a form of fire-resistive construction; in fact, is the best known form, and also the most effective form of terra-cotta fire-resistive construction. A very helpful discussion of the cost of brickwork will be found in a brochure entitled "Brick, How to Build and Estimate," issued by the Common Brick Manufacturers' Association. It forms a particularly interesting sidelight upon the methods outlined in our own article, entitled "Estimating the Cost of Brickwork," which appeared in the Contract Record of August 23, 1922.

Terra-cotta and gypsum constructions are largely used for walls, floors, partitions and roofs and are usually placed by masons. These two types will be fully discussed in this article. Concrete fireproofing is, however, usually placed by laborers, and since the same general methods apply, it will be more fully discussed in a succeeding article.

Hollow Tile Fireproofing

The term fireproofing, as here used, includes all those forms of hollow terra-cotta building material that are commonly used, such as, flat and segmental floor-arches, roof arches, "book" tile, beam, girder— and column-covering, wall and partition tile, furring tile.

In taking off quantities of tile required for any piece of work, it is necessary to make some allowance for breakage in handling and in cutting to fit around openings, against jambs, etc. It is impossible to lay down any exact rules for figuring the breakage, it may vary all the way from one per cent to ten per cent but a good method is:

- to allow 3% breakage for areas having no openings,
- no deductions for openings under ten square feet,
- one-half of openings from ten to twenty-one square feet,
- deduct full opening, if over twenty-one square feet and add enough tile to go once around the opening.

Practically all forms of hollow tile fireproofing can be figured and bought by the square foot or by the piece. If you buy by the piece, remember that you only need one 12 x 12 tile, no matter what the thickness, per square foot but one and one-half tiles, if you buy the 8 x 12 size.

"Book" tile, which are used for roofs where no heavy loads are to be carried, and are so called because their "tongue and groove" cross-section makes them resemble large books, usually come in 12 x 24 size, so that each tile will lay two square feet. They are usually placed upon a structural steel frame consisting of angles and tees, and therefore no form work or centering is required.

Furring tile usually come in the "split" form, i.e., a block resembling a partition block which is scored in such a manner that it can readily be split into two halves, each of which is a furring tile.

When figuring flat or segmental arches for estimating purposes, it is sufficient to take from the plans the number of square feet to be covered but, when listing tile for shipment to the work, it is necessary to carefully compute the number of skewbacks, key blocks, voussoirs, soffit tile, girder shoes, etc., that will be required.

The literature issued by such companies as the National Fireproofing Company contains such a wealth of information on that subject that it is unnecessary to encumber these pages with a repetition of it. However, it is essential that care should be taken to figure upon exactly the kinds of tile in each case that the specifications require; dense, porous or semi-porous, smooth-faced, scored, etc.

Cost of Handling

In earlier articles we have discussed very thoroughly the cost of hauling and knowing the weight of the various kinds of tiles likely to be used, it is a simple matter to determine the number that can be handled in a load. The cost of loading and unloading is not so simple a matter, since there is such a variety of weights to be considered and since it is possible for a man to handle a tile weighing thirty pounds about as quickly as one weighing twenty pounds.

The following tables provide the necessary data for estimating loading and unloading costs, hauling, etc.

Table 1. Weights of Hollow-Tile

	Partitions Lbs. per block	Book-tile per sq. ft.
2 x 12 x 12	12	12
3 x 12 x 12	14	14
4 x 12 x 12	16	18
5 x 12 x 12	19	
6 x 12 x 12	22	
7 x 12 x 12	25	
8 x 12 x 12	30	
9 x 12 x 12	33	
10 x 12 x 12	35	
12 x 12 x 12	40	

Split furring tile weigh the same per block as a partition block of twice the thickness.

Floor Construction. (Lbs. per sq. ft.)

Thickness	Segmental	End Const'n, Flat.	Side Const'n, Flat.
6″	27		27
8″	33	27	28
9″		31	36
10″		33	39
12″		38	44

Note.—Prices of hollow-tile are often quoted on the ton basis. From the figures given above it is then possible to determine the square-foot price of any size.

However, the weights given in the table are average or standard weights and may vary appreciably in different localities. Care should therefore be taken to determine whether these weights apply when buying fireproofing by weight.

Table 2. Labor Costs of Loading, Unloading, and Handling Hollow-Tile

General.

A tile barrow load is approximately	250 lbs.
A hod load is approximately	75 lbs.
A man wheeling loaded barrow moves	100 ft. per min.
A man wheeling unloaded barrow moves	110 ft. per min.
A man carrying loaded hod moves	85 ft. per min.
A man carrying empty hod moves	100 ft. per min.

Loading Barrows from Pile or Unloading Barrows to Floor or Scaffold

(Labor-Hours per 100 square feet.)

	(1) Partitions.	(2) Floor Tile.
3″	0.70	
4″	0.75	
5″	0.80	
6″	0.83	0.90
7″	0.85	0.95
8″	0.95	1.
9″	1.	1.10
10″	1.10	1.15
12″	1.25	1.30

The cost of building scaffolds for partition work can be determined on the basis of one scaffold builder for each four masons; and for wall-furring, one scaffold builder for each three masons.

The cost of making and handling the mortar is of course, the same as for the same grade of mortar when used for brickwork. (Note. The best results in hollow tile construction are obtained with a strong cement mortar to which enough lime-putty has been added to make it spread very freely. This works better than a lime and cement mortar made in the ordinary way).

Table 3. Laying Hollow Tile

(Masons' Time per 100 sq. ft.)

Thickness	Partitions	Furring	Segmental Arches	Flat Arches
2″	4.	3		
3″	4.5	4		
4″	4.5			
5″	4.5			
6″	5.		3.	4.
7″	5.		3.	4.
8″	5.5		4.	5.
9″	6.		4.	5.
10″	6.5		5.	6.
11″	7.		6.	7.
12″	7.		6.	7.

Note.—The time given for partition work is based upon 12 x 12 tiles. Where 8 x 12 tiles are used it will require 25% more time to lay the same number of square feet.

In figuring costs be sure to include scaffold-building, mortar making, tending, and for floor systems, building forms or "centering" and removing forms.

Where metal strips, or other forms of ties are specified in partition work, add one hour of masons' time per 100 sq. ft.

Where nails must be driven into brick walls to act as anchors for furrying, add four hours of mason's time per 100 nails, which will usually be spaced about 25 nails to the 100 sq. ft. of partitions.

Table 4. Hollow Tile Specialties

(Hours of Masons' Time per 100 sq. ft.—per 100 lin. ft.)

	Round Col. Covering	Square Col. Covering	Soffit Tile	Shoe Tile
2″	2.	2.5		
3″	2.5	3.		
4″	3.	3.5		
			1.5	1.5

In some localities it is practicable to have the laborers set the soffit tiles under the beams when putting up the forms but bricklayers are inclined to object to the practice. (Note.—Where "lip" skew-backs are not used, one soffit-tile will be required for each linear foot of steel beams).

Where the girders are to be fireproofing it will usually require two shoe tiles, or girder tiles, and one soffit tile for each linear foot of girder. Besides that when the girders extend more than three inches below the bottoms of the beams, it will be necessary to figure upon sufficient partition tile, or hollow bricks to fill the space between the top of the shoe tile and the under side of the floor construction.

Table 5. Mortar Required

(Cubic Yards per 100 square feet.)

Thickness	Furring	Partitions Col. Covering Book Tile	Floor const'n
2″	.07	.10	
3″	.09	.12	
4″		.14	
5″		.15	
6″		.17	.17
7″		.20	.20
8″		.23	.23
9″		.26	.26
10″		.29	.29
11″		.33	.33
12″		.36	.36

This table is figured upon the basis of an average thickness of joints of ½ inch. It would be possible to construct a table giving the amount of mortar for any thickness of joints but, since the edges of the tiles are seldom straight, it is not practicable to maintain an exactly even joint and this table is, therefore. as nearly correct as working conditions warrant.

Table 6. Load Bearing Tile

Size	Weight per Square foot	Masons' Time per 100 sq. ft.	Cu. yds. Mortar per 100 sq.ft.
6 x 12 x 12	29	6	.26
8 x 12 x 12	34	7	.30
10 x 12 x 12	40	7.5	.38
12 x 12 x 12	52	8	.45

Load bearing tiles are used for outside wall construction as well as bearing partition construction, to take the place of brickwork. They are usually faced on the outside by stucco but simetimes smooth-faced blocks are used that require no other finish.

The cost of handling these tiles, except mason's time in laying, may be calculated from Table 2 by increasing the times given for partitions by ten per cent.

Interlocking tiles, of the Denison patented type, have come into very general use and are now made by several licensees. These licensees are glad to furnish much more detailed information as to the use of interlocking tiles than is given here but Table 7 gives all of the necessary information for figuring the cost of handling and laying.

Table 7. Interlocking Wall Tile

Weight of 1 tile = 17 lbs.
Corner tiles—2 required for each lin. ft. of corner.
Jamb tiles—1 required for each lin. ft. of jamb.
Bonding tiles—0.7 required for each sq. ft. of 16″ wall.

Quantities per 100 Sq. ft. of Wall

Thickness	Tiles	Bonding Tiles	Cubic Yards Mortar	Hours Masons' Time
8″ tile wall	210		.30	9
8″ backing to brick wall	180		.25	8.5
12″ tile wall	320		.45	14.
16″ tile wall	400	70	.63	21.
21″ tile wall	530		.75	24.

For each linear foot of jambs or corners, add 0.10 hour masons' time.

Figure cost of handling, unloading, etc., in the same manner as for an equal number of 4″ partition blocks.

(Note.—The time for foreman on all hollow-tile work should be figured by the method previously indicated in connection with brickwork).

Forms or Centering

In fireproofing the term "centering" is probably in more general use than is the term "forms," though both have practically the same meaning. However, for hollow-tile floor arches, of all types, it is most usual to use forms which are merely assembled from scaffold-planks and "stringers," hung from the steel floor framing by means of adjustable wrought-iron hangers. The work is usually done by laborers.

For combination hollow-tile and concrete construction, it is usual to build up the form of planking which, because of the longer spans used, must be supported at regular intervals by "shores" or posts. The work may be done either by carpenters or handy laborers. For reinforced concrete or cast-in-place gypsum construction, it is usual to build a tightly constructed form of boards, supported by joists, posts, or other members may be necessary. This work is almost invariably done by carpenters.

Centering for Hollow Tile Arches

Centering for flat-arches is a very simple form of construction, particularly where the ceiling surface is kept level and carried on the line formed by the under surface of the skew-backs.

Stringers, usually built of two pieces of 2 x 6 timber, separated by 1″ blocking at fairly close intervals, are usually used, though some builders use single stringers. The stringers are hung from the beams by wrought iron hangers, ¾ inch round rods being used, which are fitted with clips which attach to the upper flanges of the beams. Adjustment in length of the hangers is provided by a screw thread and nut at the top. Scaffold planks are then laid across the stringers to form the surface upon which the tiles are laid and which supports the tiles until the mortar in the joints has set and the arches become self-supporting.

When the specifications require that the arches must be cambered (usually the amount will not exceed ½ inch), additional stringers must be provided over the tops of the beams and the lower hangers supported at the center of the span. Then the skew-backs or soffit-tiles can be set at the beams, and the hangers drawn up in the middle so as to give the required camber. This is termed "center-hung centering."

Centering for segmental arches, is made as for flat arches but, in addition, arch forms consisting of segmental ribs, cut to proper cross-section, and covered with 1 inch strips, are placed on top of the planking in order to give the curved shape to the arch.

As it is usual in steel-framed buildings to keep the spans between beams as uniform as possible, very little cutting of the lumber is necessary and it should be possible to use all of the lumber over at least four times.

The figures in table 8 are the amount of lumber needed for one time; the cost of the material actually used will be found by dividing the quantity given ,by the number of times it can actually be used. This number cannot be determined without knowing the conditions under which the work is to be done. For instance, if you built a four-storey building this season and were pushing the work with any speed at all, you would probably put in enough forms for the first and second floors. Then the first floor forms would be re-used on the third-floor and roof, the second-floor forms would be re-used on the fourth-floor. This is an average use of 2½ times. If you had no further use for them as centering, you could then credit the planks to the job at their depreciated value as second-hand scaffold-planks and the stringers as so much wood. On the other hand, if you are constantly installing hollow-tile arches, the stringers should have a very long life. The hangers should last indefinitely, so it is entirely a matter of judgment as to what proportion of their cost should be charged to any job. This is a subject that will be discussed in much greater detail in a later article.

When using table 8, it is necessary to first figure the cost of getting the lumber to the site of the work, unless you buy it delivered on the job.

Table 8. Centering for Hollow-Tile Arches

(Per 100 Sq. ft.)

		Segmental arches	Flat arches		
			Center hung	Side hung	Add for raised skewbacks
FBM	timber	80	100	80	20
"	plank	80	210	210	
"	boards	145			
Hours	laborers	5	5	4.5	0.5
"	Carpenters	2.5			

The time given for laborers includes that taken for removing the forms after use. The time given for carpenters is that required for cutting out the arch-ribs and attaching the "lagging."

Gypsum Fireproofing

In general, the laying of pre-cast gypsum fireproofing, such as solid or hollow partitions, furring, etc., is an operation very similar to the laying of corresponding shapes of terra-cotta hollow tile, but the work will ordinarily proceed much more rapidly because the nature of the material, as well as its lighter weight, making practicable the use of much larger units. The partition tiles are usually made 12 x 30 inches, so that two and a half square feet of partition can be laid at one operation.

Another reason why faster work can be done with gypsum fireproofing is the much more regular shape of the units. Being cast, and not burned, gypsum partitions are not subject to any shrinking or warping that will draw them from their intended shapes.

Because of the greater speed of laying, more scaffold men will be required to keep the same number of bricklayers busy than would be the case with hollow-tile and an average of one scaffold builder for each mason is a fair basis for figuring.

The cost of handling gypsum partitions may be figured on the basis of the notes at the head of table 2 and by substituting the figures in column 3 of table 9 for those in column 1 of table 2.

The cost of laying and the amount of mortar required can be determined directly from the proper columns of table 9 but it should be remembered that either "patent plaster" or "prepared mortar" are used with gypsum partitions. Portland cement mortar will not properly bond gypsum construction.

Table 10 gives the quantities of materials needed to produce a cubic yard of mortar and the cost of mixing this mortar may be figured as explained in the discussion of Brickwork.

Table 9. Gypsum Partitions

(1) Size	(2) Weight per Sq. ft.	(3) Labor hrs. loading or unloading per 100 sq. ft.	(4) Mason hrs. laying 100 sq. ft.	(5) Cu. yds. mortar per 100 sq. ft.
2 x 12 x 30	7	0.50	3	.04
3 x 12 x 30	10	0.55	3.	.05
4 x 12 x 30	13	0.58	3.5	.07
6 x 12 x 30	17	0.65	4.5	.10
8 x 12 x 30	23	0.70	5.5	.14

The figures in column 5 are based upon an average thickness of joints of ½".

Table 10. Mortar for Gypsum Fireproofing

Proportions	Pounds patent mortar	Cu. yd. sand.
1-2	1300	0.94
1-2 1/2	1150	0.96
1-3	1000	1.00

Cast-in-place gypsum constructions, as well as long-span pre-cast gypsum constructions, are essentially the products of companies specializing in those lines. Those companies make a practice of taking contracts for the complete installation of their products so no discussion of their costs is necessary here.

Combination Hollow Tile and Concrete Floor Construction

Because of the number of different types of "systems" of combination hollow tile and concrete floor constructions is very great and because some of them are covered by patents, and can only be installed by licensees under such patents, no attempt will be made to make this paper cover every form of construction in general use. Only the "standard" types can be covered here but the same principals can be used for any other system when the details of it are known.

Such books as Concrete Engineer's Handbook, by Hool and Johnson (McGraw-Hill Book Co.), Useful Data, published by Corrugated Bar Co., and the literature issued by National Fireproofing Co., and other manufacturers of hollow tile contain all of the information needed by the engineer who would determine the requisite thickness of the tiles, thickness of top-course and amount of reinforcing steel.

In a previous article (Estimating the Cost of Plain Concrete in our July 26, 1922 issue) we have discussed the methods to be used in estimating the costs of the materials needed to make concrete of given proportions, as well as the cost of mixing that concrete and placing it under most of the conditions likely to be encountered in ordinary building construction. The same principles are to be used in estimating the cost of the concrete used in combination hollow tile and concrete construction and the quantity of concrete can readily be determined by reference to the specified requirements for thickness of tile and thickness of top-slab, if any.

Since tiles 12" wide, separated by a "rib" or "joist" 4" wide, is almost the universal type, it is evident that the joists are always 16" center to center and, therefore, each square foot of floor contains ¾ the amount of concrete in one linear foot of "joist," plus the amount of concrete in a square foot of top-slab. Thus, a construction of 6" tiles, with a 2" top-slab, will contain the following quantities in each 100 sq. ft. of floor.

75 6 x 12 x 12 tiles
75 lin. ft. 6" x 4" joists = 12.5 cu. ft.
top-slab (2" x 12" x 12")
x 100 = 16.7
———
29.2 cu. ft. = 1.08 cu. yd.

Table 11 gives the concrete quantities for a variety of constructions (the tile quantity is always 75 where the width of joists is 4" and the quantities for any other construction are determined by following the method given above). In the table an allowance of 5% has been made in the joists to provide for the additional concrete used at the ends of the rows of tile, over the supports.

Table 11. Cu. Yds. of Concrete Per 100 Sq. Ft. of Floor

Construction	Con. in Joists	Con. in Slab	Total
4 + 2	.49	.62	1.11
4 + 2½	.49	.78	1.27
5 + 2	.61	.62	1.23
6 + 2	.73	.62	1.35
8 + 2	.97	.62	1.59
8 + 2½	.97	.78	1.75
10 + 2	1.21	.62	1.83
10 + 2½	1.21	.78	1.99
10 + 3	1.21	.93	2.14
12 + 2	1.46	.62	2.08
12 + ½	1.46	.78	2.24
12 + 3	1.46	.93	2.39

The cost of getting the tiles into the building can be estimated from the information given in tables 1 and 2, using the columns headed "Partitions."

Placing the tiles on the forms, which can almost always be done by laborers, is an item that must not be overlooked and can be calculated from table 12.

Table 12. Placing Tiles on Forms

Thickness	Labor hours per 100 sq. ft.
4 inch	3
5 "	3
6 "	3.5
7 "	4
10 "	5
12 "	5.5

Reinforcing Steel

Because this form of construction is not ordinarily used for heavy live loads, it is not customary to use complicated reinforcement. The most common method is to use one or two bars in each rib, either or both of which may be bent up at supports. Where the rods are carried across a support, care must be taken to figure in the necessary added length of rod and its weight.

The weight of the steel may be calculated by counting the number of rods, then multiplying them by their length and weight per foot or the method indicated in table 13.

Table 13. Reinforcing Rods

Nominal size	Weight per lin. ft. round bar	Weight per lin. ft. square bar	Pounds per 100 sq. ft. One round bar per joist	Pounds per 100 sq. ft. One square bar per joist
½"	0.67	0.85	51	64
⅝"	1.05	1.35	79	102
¾"	1.52	1.91	114	143
⅞"	2.06	2.64	155	198
1 "	2.67	3.40	200	255
1⅛"	3.41	4.30	256	322
1¼"	4.20	5.35	315	403

Always add 5% to the computed quantity of steel, in order to take care of waste due to cutting, bending, etc.

Because stirrups, and similar members, are not regularly used in hollow tile and concrete constructions, the cost of forming and installing them will be fully covered in the next article, which takes up the entire subject of reinforced concrete work.

It is the custom to purchase the steel cut to scheduled lengths so the only costs that you would have at the site are bending and placing. This work can just as readily be done by any handy men, after a little training, but union regulations in many sections require reinforcing steel to be placed by structural steel erectors or metal-lathers.

Table 14 gives the production that may be expected from men of ordinary skill under good supervision.

Table 14. Reinforcing Steel
Time in Labor Hours

Bar sizes	Bending per 100 eighth or quarter bends	Placing 100 bars Under 10 ft. long	Placing 100 bars 10 to 20 ft. long	Placing 100 bars 20 to 30 ft. long
½ inch or under	1.	4.50	5.75	7.
¾ and ⅞ inch	1.33	5.25	6.75	8.25
1 inch	1.67	6.25	8.	9.75
1¼ and 1⅛ inch	2.	7.50	9.75	11 50

Forms

For a "one-way" type of floor construction, open forms, similar to those used for ordinary hollow tile floor construction, except that supporting "shores" or posts will be required, will suffice. In fact, it is only necessary that the planks should be spaced so as to come under the "joists" or ribs and to extend a sufficient distance on either side to support the tile.

For a "two-way" construction, however, unless some form of "channel tiles" are used, it will be necessary to construct a solid floor of form work, as for a straight reinforced concrete slab. Except for the item of forms, the instruction given here for estimating "one-way" construction will apply for "two-way" construction, if proper allowance is made for the difference in quantities.

A good type of form construction consists of 2 x 8 planks, one under each "joist," resting on 4 x 6 joists, supported by 4 x 4 posts. There will also be the necessary amount of bracing and bolsters, and short planks or pedestals under the lower ends of the posts. Table 15 gives the necessary information for determining the number of joists and posts required, and 25% should be added to the quantities thus calculated in order to take care of the bracing, bolsters and pedestal. Salvage values are to be determined upon the same basis as that already outlined for centering for hollow tile construction.

Table 15. Form Joists and Posts

Construction	Spacing of joists in inches	Spacing of posts in inches
4 + 2	58	72
4 + 2½	58	72
5 + 2	56	66
5 + 2½	56	66
6 + 2	56	66
8 + 2	52	60
8 + 2½	52	60
10 + 2	50	54
10 + 2½	50	54
10 + 3	50	54
12 + 2	48	48
12 + 2½	48	48
12 + 3	48	48

Thus, to support a floor construction consisting of 10" tile and 4" x 10" concrete joists with 2½" top, over an area 25 x 100 feet, would necessitate the use of the following form lumber, the clear storey height being assumed as 12 feet:

Planks (25' length not being a stock length in most places, we must use a 14' and a 12' length) 2 x 8's, 75 pcs. of 12', 75 pcs. of 14' =	2600 fbm
Joists (25 feet divided by 50 inches plus 1 joist)=7 rows; 4 x 6, 35 pcs., 20' long	1400 "
Posts (7 rows of joists, 100 ft. long, 1 post each 54 inches, plus 1 post in each row) = 161 posts; 4 x 4, 161 pcs., 12' long	2576 "
Braces, etc, (25% of joists and posts)	944 "
	7520 "

which equals practically 3 fbm per sq. ft. of floor construction.

The total time required for handling this material, after delivery to the site, may be calculated from table 16. The time is given there in labor hours, to be divided by the estimator among carpenters and laborers as local conditions may require, but the work is not beyond the skill of good laborers.

Table 16. Labor on Forms

Assembling and erecting	15 hrs. per 1000 fbm
Stripping	6 " " " "
Re-erecting	11 " " " "

Course in Wood Construction

"Wood as a Building Material" is the title of a new short course of instruction announced by the U. S. Forest Products Laboratory for December 10 to 15 at Madison, Wisconsin. It is designed primarily for architects, construction engineers, and contractors and for others interested in the use of wood in building construction. It deals largely with the use of structural timbers from the standpoint of economy, safety and permanence. Full information and condtions of enrolment may be obtained from the director of the laboratory at Madison, Wis.

Water Resources Paper

The Water Power Branch of the Department of the Interior of Canada has issued Water Resources Paper No. 38, covering hydrometric investigations of the St. Lawrence and Southern Hudson Bay watersheds in the province of Ontario for the climatic year ending Sept. 30, 1922.

Ontario Highways Department Investigates Checking of Concrete Road Surfaces

Field Observation and Laboratory Investigation Lead to the Conclusion that Absorbtive Bases, Rich Mixtures, and a Large Width-Depth Ratio Are Detrimental—Well Wetted Subgrades and Burlap Covers Offset Checking

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During the past, in laying concrete road surfaces in certain localities, the concrete has persistently checked, although every precaution has been taken to prevent it. It was more or less prevalent during the summer of 1922 on certain contracts where the sub-grade was clay.

In order to determine the cause of such checking a pavement that was laid early in the autumn was selected for close observation. The concrete was laid on a brown clay sub-grade with stretches here and there that were inclined to be sandy. The contractor did not get started until well on in September, due to rain and bad weather. About two weeks later, in an endeavour to expedite the work, owing to the lateness of the season, the contractor put on an evening shift, running from 7.00 p.m. until 10.30 p.m. An examination of the previous day's work, one morning, revealed a check about two feet in length in the section laid by the evening shift. This eliminated the sun as a factor in this particular check. Points where dry batches and sandy batches were placed were marked and observed for checking, with no results. The sand was suspected and material from another source tried, with no betterment. An occasional check only was showing up, many slabs having none. The contraction of the concrete was making itself manifest in another way—it was pulling away from the expansion joint material for an eighth of an inch or more.

No change was noted in the character of the sub-grade except that it was drying out and becoming dusty from the traffic of the light batch trucks which supplied the mixer. After every move the sub-grade was well watered before laying concrete and the finished work was covered with tarpaulins.

No Checks Evident After Sub-grade Wetted Down

The checking grew worse, until finally the contractor was asked to remove the loose-lying material upon the grade. This seemed to help somewhat. Two days of heavy rain stopped the work for a time and when operations were resumed it was observed no further checks occurred. The concrete was also holding tight against the joints. In this connection it was noted that the contract was first started after a heavy rain and this apparently accounted for the non-appearance of checks early in the work.

The contractor was asked to keep the grade well wet down ahead of the work, and as a result only a very few checks occurred. With this information at hand and with the object of obtaining more complete data on the matter, an investigation of the problem was undertaken in the laboratory during the winter.

Small slabs were made, 18 inches square and 3 inches deep, of 1 : 1½ : 3 concrete, poured on clay bases. Base No. 1 was a saturated clay containing 26 per cent. moisture; base No. 2 was the natural clay as brought into the laboratory, with 14 per cent. moisture; and base No. 3 was clay that had been thoroughly dried, containing practically no moisture. The concrete slab on the dry base dried off quickly and was so firm in one hour and thirty minutes that it could no longer be trowelled. The slab on the base with 14 per cent. moisture took its set in two hours. The slab on the saturated base dried off very slowly and set in five hours. No checking occurred in any of these slabs, but on the dry base and the base containing 14 per cent. moisture, considerable contraction had taken place, as noted by the pulling away of the slab from the side-forms.

Mention will be made of slabs taking a set within a certain time. This may be defined as the time when the water has entirely disappeared from the surface and the mix has become sufficiently stiff so that further floating or trowelling brings no water to the surface, but leaves a smooth finish.

The ratio of depth to length of the above slabs was 1 : 6 and it was concluded that the cohesion of the concrete was sufficiently great to pull away from the side-forms before opening in the form of checks.

Quick Setting of Slabs on Dry Base

A second series of slabs were then made, ¾ inch in depth, the size, 18 inches by 18 inches, remaining the same, making a new ratio of 1 : 24. With this depth it was impossible to use the stone as before and a 1 : 3 mortar was substituted. Four slabs were made in this series: slab No. 1 poured on the saturated base with 26 per cent. moisture; slab No. 2 poured on a dry pulverized base; slab No. 3 on a combination base, a dry centre 8 inches square and the remainder of the area wet; slab No. 4 on a dry base as No. 2, but with a wetter mix.

Slab No. 1 on the saturated base acted much the same as in the previous series. It still took five hours to set. Changing the thickness did not seem to alter this feature. Slab No. 2 on the dry base took only 20 minutes to set, so that it could no longer be trowelled. Slab No. 3, on the combination base, took 30 minutes, the portion over the dry base setting up first, but it rapidly drew the moisture from the remaining part. Slab No. 4, wet mix on the dry base, took 20 minutes. The only difference the wet mix made was to produce an inferior mortar of low strength. In removing it from the form it broke up easily. The slabs poured on the dry bases still showed considerable contraction by moving away from the forms, and they set so quickly that it was impossible to finish them properly. Not only did the water disappear but the cement as well was drawn down from the surface, leaving a rough finish. This feature serves to illustrate the quick setting many times observed on road construction, but most frequently blamed on the dry mix. Examination of the under side of the slab indicated that the different batches were failing to bond together properly at the bottom, due to their rapid setting on coming in contact with the dry clay.

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*Mr. Macdonald's report on "The Checking of Concrete Road Surfaces" is appearing in the annual report of the department for the year 1922.

Because the thin ¾-inch slabs on the dry clay were so difficult to finish, it was thought best to find the minimum depth that would finish properly and to increase the size of the slab to get the larger ratio. 1:1½:3 concrete was used in slabs 9 inches by 18 inches, of varying depths. Their setting times were as follows:

9″ x 18″ x 2″	set in 40 minutes.
9″ x 18″ x 2½″	set in 1 hour.
9″ x 18″ x 3″	set in 1 hour and 20 minutes.
9″ x 18″ x 3½″	set in 1 hour and 30 minutes.

The minimum depth that proved satisfactory for finishing was 3 inches.

The size of the slab was increased to 3 feet square with a depth of 3 inches. A 1:1½:3 concrete was used with a very coarse sand. One small check about 1½ inches in length occurred in this slab. A fine sand was used in the next slab in place of the coarse, but it failed to show any checks. Fig. 1 shows the mechanical analysis of the fine and coarse sand used in the above experiments and in the remainder of the tests.

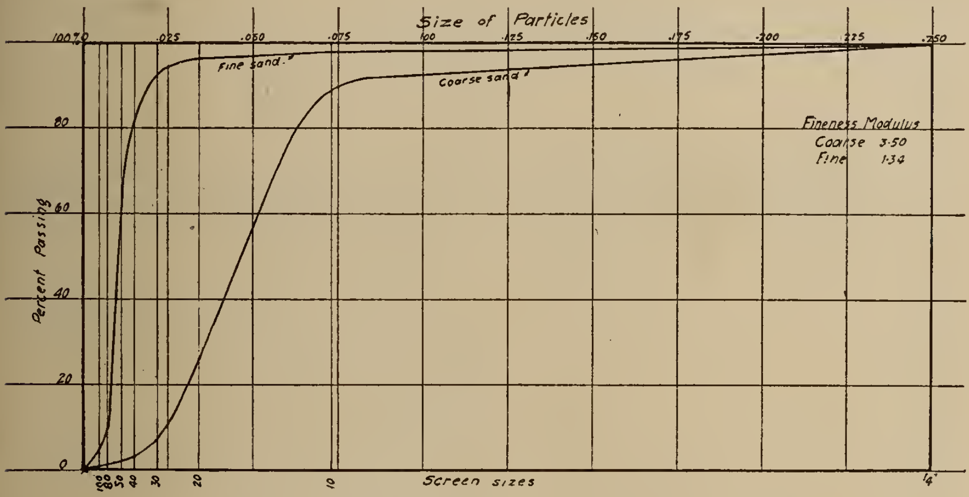

Fig. 1—Mechanical analysis of fine and coarse sands used in experiments

Relation of Type of Base to Contraction

At this point, due to the unsatisfactory results obtained so far, it was thought advisable to investigate the contraction of neat cement, having in mind the contraction cracks sometimes observed in the constancy of volume tests for cement.

Pats of neat cement were made about 6 inches in diameter, ½ inch thick in the centre and thinning out to a feather edge. These were placed on the following bases: glass, blotting paper, brick, porous concrete and plaster of paris. On glass no checking was noticed until after it was 24 hours old. On blotting paper it dried out quickly, merely curling the edges up and failing to check. On brick it dried out very quickly and formed several large checks. On porous concrete it set up somewhat more slowly than on brick and checked badly. On plaster of paris it dried off quickly and formed but one short check.

These experiments showed that with the rapid loss of moisture considerable contraction occurred. This contraction took place irrespective of the type of base, providing it had absorptive qualities. The checking was most severe on bases that had a high co-efficient of roughness, such as brick and porous concrete. On the plaster-of-paris base, which was quite smooth, the neat cement moved easily from the edges toward the centre during the period of contraction. This was not the case with the brick and cement bases. The neat cement remained where it was placed and contraction manifested itself by the opening up of large and irregular cracks.

The above experiments also tended to show that two distinct forms of contraction took place On the glass plate it did not take place until after the final set and the mass had become rigid. On the other hand the absorptive bases showed the contraction and checking taking place while the mass was in a plastic state. The first was undoubtedly due to evaporation and the second to absorption.

A series of neat cement pats were made up on the following bases: glass, brick, and porous concrete, and was placed in the moist closet. The pats on brick and porous concrete checked to the same extent as in the open air. The pat on the glass plate remained at constant volume and showed no checks.

In Fig. 2 are shown the pats of neat cement on glass; on the left cured in the moist closet and on the right air-dried, showing checks formed by evaporation.

The porous concrete base had proven to be the most satisfactory absorptive medium so far used where checking of the slab showed up as visible evidence of contraction. To standardize the results of further experiments, small forms were made 6 inches square and ½ inch deep, giving a ratio of depth to length of 1:12.

Three slabs were made up in these forms on porous concrete bases. Slab No. 1 was made of neat cement; slab No. 2 a 1:1 mortar using a coarse sand, and slab No. 3 a 1:1 mortar using fine sand. The neat cement slab checked badly; the coarse sand mortar showed one short check, and the fine sand mortar showed no checks.

New forms were made 8¼ inches square by ⅜ inch deep, giving a ratio of length to depth of 1:22. The above experiment was repeated with neat cement, 1:1 mortar of coarse sand and 1:1 mortar of fine sand. The neat cement checked very badly, much greater than in any previous test. The coarse sand checked in several places, showing fine, wavy, hair-line cracks. The fine sand checked in one place only.

Two conclusions may be drawn from the above experiments. First, with the greater ratio of length to depth there is a correspondingly greater tendency to check. The 1:1 fine sand mix is leaner than the 1:1 coarse mix because of the higher water ratio to volume of cement for the same consistency.

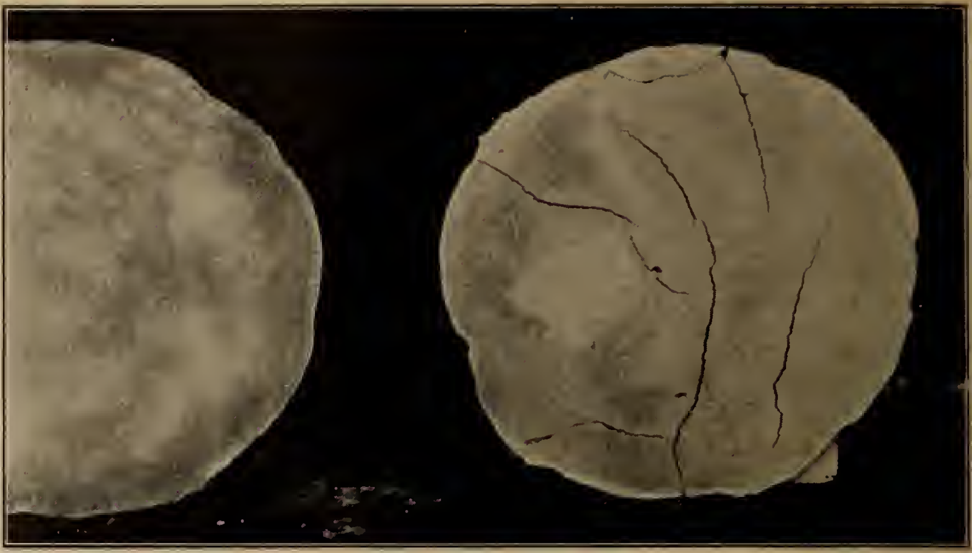

Fig. 2—Neat concrete slabs on glass base. Left, dried in moist closet; right, dried in open air

A further series was then undertaken, using the 8¼ inch forms. Slab No. 1, neat cement on a glass plate; slab No. 2, 1 : 1 coarse sand mortar on glass plate; slab No. 3, neat cement; slab No. 4, 1 : 1 coarse sand; slab No. 5, 1 : 2 coarse sand, the last three on porous concrete bases. The neat cement nor the 1 : 1 mortar on the glass did not check. The neat cement on the porous base checked badly; the 1 : 1 mix developed several checks, but the 1 : 2 showed none. It may be stated that at no time later did this neat cement slab on glass check as did the neat cement in the form of a pat in a previous experiment. The latter form with a thick centre and thin edges showed several checks. The shape of the specimen apparently has considerable effect on this action.

Effect of Humidity and Saturated Bases

Humidity was next investigated. Six slabs were made up of neat cement. Two were made on glass plates, two on moderately absorptive bases, water being dashed on the porous concrete, and two on dry porous bases. One of each pair was placed in the moist closet immediately after pouring and the other was left to air-dry. The neat cement pulled away slightly from the forms on the glass plate in the open air but showed no movement whatever in the moist closet. On the moderately absorptive base, one check developed in the moist closet and three showed up in the open air. On the porous bases both slabs were badly checked. High humidity may have some effect in retarding checking on moderately absorptive bases, although the result was not very conclusive. On highly absorptive bases it apparently had no effect.

Experiments were next carried out to find the effect of using saturated bases. The same bases were used as for the previous tests; those requiring to be saturated were placed in water over night. Nine slabs in all were made in this series, introducing the three variables of base, humidity and mix. Five were allowed to remain in the open air: slab No. 1, neat cement on glass plate; slab No. 2, neat cement on dry porous concrete; slab No. 3, neat cement on saturated concrete; slab No. 4, 1 : 1 coarse sand on dry porous base; slab No. 5, 1 : 1 coarse sand on saturated base.

The remaining forms were placed in the moist closet, viz.: slab No. 6, neat cement on dry base; slab No. 7, neat cement on saturated base; slab No. 8, 1 : 1 coarse sand on dry base; and slab No. 9, 1 : 1 coarse sand on saturated base. These slabs were all 8¼ inches square and ⅜ inch in depth.

Examining the slabs air-dried:—

Slab No. 1, neat cement on glass plate (Fig. 3), had no checks but slight contraction is noted from the right hand form.

Slab No. 2, neat cement on dry porous base (Fig. 4), checked very badly.

Slab No. 3, neat cement on saturated base, showed no checks and very little contraction from the sides. Fig. 5 illustrates the above two slabs, the only variable is the base, on the left dry and porous, and on the right saturated.

Slab No. 4, 1 : 1 coarse sand on dry base, checked slightly in six places. (Fig. 6, left.)

Slab No. 5, 1 : 1 coarse sand on saturated base, showed no checks. (Fig. 6, right.)

The slabs cured in the moist closet gave the following results:—

Slab No. 6, neat cement on dry, porous base, checked at many points with broad cracks and also pulled away considerably from the side-forms. (Fig. 7 left.)

Slab No. 7, neat cement on saturated base, showed no checks and had the typical dull appearance of moist cured concrete. (Fig. 7, right.)

Slab No. 8, 1 : 1 coarse sand on dry porous base, checked at twenty different points in fine hair-line cracks. (Fig. 8, left).

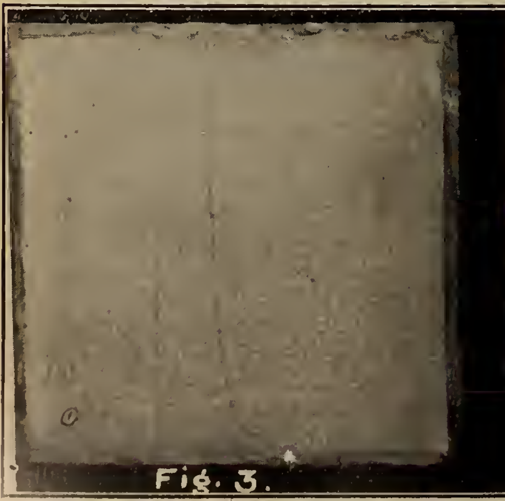

Fig. 3—Neat concrete slab on glass, dried in open air, showing the shrinkage from side forms but no checking

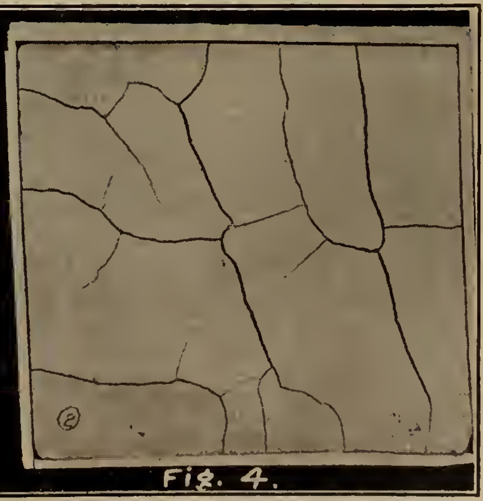

Fig. 4—Neat concrete slab on dry porous base, air dried, showing bad checking

Slab No. 9, 1:1 coarse sand on saturated base, showed no evidence of contraction. (Fig. 8, right).

Slabs No. 7 and No. 9 may be said to have been cured under ideal conditions—no absorption or evaporation except while finishing could take place, and during their whole period of setting and acquiring strength they remained at constant volume and were under no contraction stress.

A study was undertaken to find the percentage of water lost by absorption and that lost by evaporation. Two slabs were made up of neat cement, 4½ inches square and ⅜ inch deep. These were placed on plaster-of-paris bases, one of which had been previously placed in water over night, and the other dried in the open air.

The slab on the dry absorptive base dried off quickly and set up so that it could easily be removed from the forms at the end of an hour. The increase in the weight of the plaster-of-paris base and of the side forms was carefully noted and also the loss in weight of the cement slab at different intervals with the following results:—

Time	Percentage of original water content lost. By absorption in base and forms	By evaporation	Total
0 hour	0%	0%	0%
1 hour	47	4	51
7 hours	..	17	64
24 hours	..	31	78
2 days	..	34	81
1 week	..	35	82
2 weeks	..	37	84
3 weeks	..	35	82

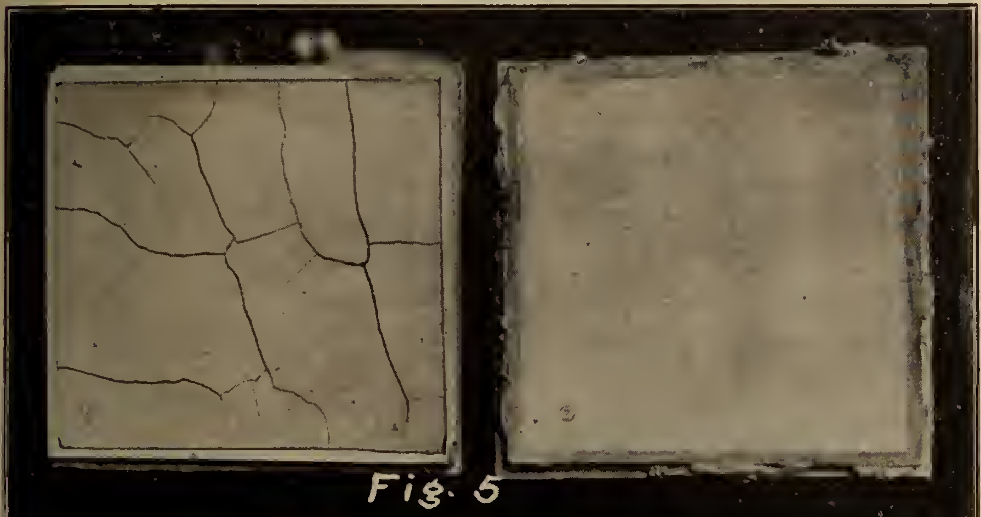

Fig. 5

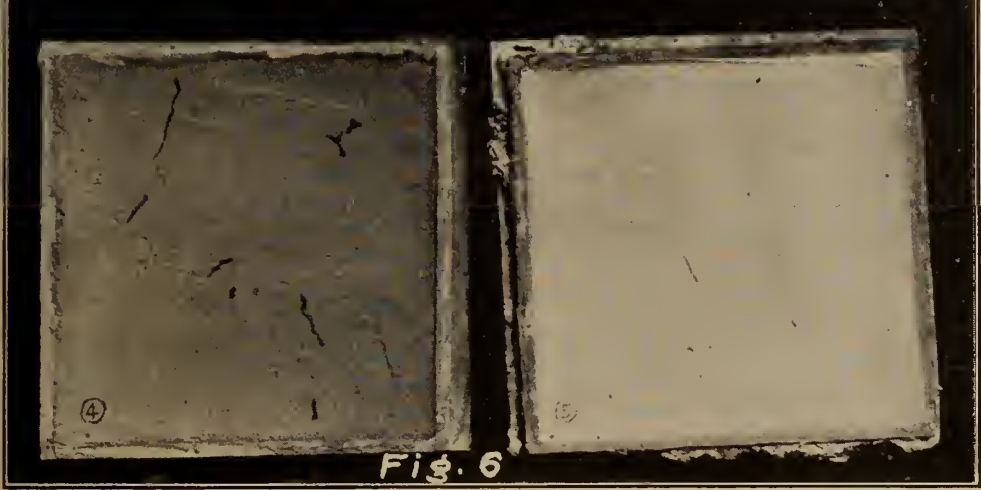

Fig. 6

Fig. 5—Neat cement slabs dried in air; left, on dry porous base; right, on saturated porous base.
Fig. 6—Sand-mortar slabs air dried; left, on dry porous base; right, on saturated porous base

The slab on the saturated base was placed in the moist closet after it had set sufficiently to finish. While finishing 10 per cent. was lost by evaporation. After one week in the moist closet it was removed from the forms and allowed to dry out in the open air, with the following results:—

Time	Percentage of original water content lost. By absorption	By evaporation	Total
0 hour	0%	0%	0%
5 hours	..	10	10
24 hours	..	12	12
2 days	..	14	14
1 week	..	16	16
2 weeks	..	28	28
3 weeks	..	30	30

The outstanding facts from these tests was the loss of 47 per cent. by absorption within an hour by the dry base, and 31 per cent. by evaporation within the first twenty-four hours of the air-dried specimen, leaving but 22 per cent. of the original water content for the process of hardening.

With the saturated base and the moist closet curing the water content was so conserved at the end of three weeks that 70 per cent. of the original amount had been used or was available for use in the chemical action of setting. This contrasts with 18 per cent. available at the same age in the previous test.

The results of the above tests are shown graphically in Fig. 9.

Tests With Dry Clay

Attention was focused on the clay used in the previous experiments as an absorptive base. It was desired to obtain the rate of absorption and the amount: 250 c.c. of dry pulverized clay were placed in a 500 c.c. graduate and carefully covered with water to the 500 c.c. mark. Readings were taken every ten minutes of the water level in the container and the depth to which the moisture line had descended. The results are indicated by the curves in Fig. 10. Note the almost constant rate of absorption as shown by the number of inches of water required. After the moisture line had reached the bottom of the container, additional water was still required for saturation.

This condition is probably a parallel with the wetting down of a dusty sub-grade before pouring concrete. The thickness of an inch or less wet down merely acts as a vehicle for the further absorption of moisture from the concrete placed above it.

In further tests of slabs on dry clay, those made from neat cement checked. On tests of mortar slabs the high absorption was still evident, with its resulting contraction, but the base had very little restraining effect upon the movement of the slab. The slab was thus permitted to contract without the formation of checks. On large road surfaces where the slab cannot move as a whole while in a plastic state, this contraction takes place in the formation of checks where the slab has failed at its weakest point.

A test was made to find out if a saturated base would supply moisture to a slab, replacing that lost by evaporation. Two slabs were made up, one on a glass plate and one on a saturated plaster-of-paris base. There was no difference in the time of setting. After twenty-four hours the slab on the glass plate had contracted slightly from the forms but the slab on the saturated base had shown no movement, which would indicate that the wet base tends to restore the balance of water lost by evaporation.

Summary of Results

To summarize the results:—

(1) Checking is the result of contraction caused by the loss of moisture from any cause when the concrete (cement or mortar) does not possess the required strength to overcome the outside restraining forces.

(2) An absorptive base hastens the time of setting of concrete and cement mortars—the greater the absorption the shorter the time of set.

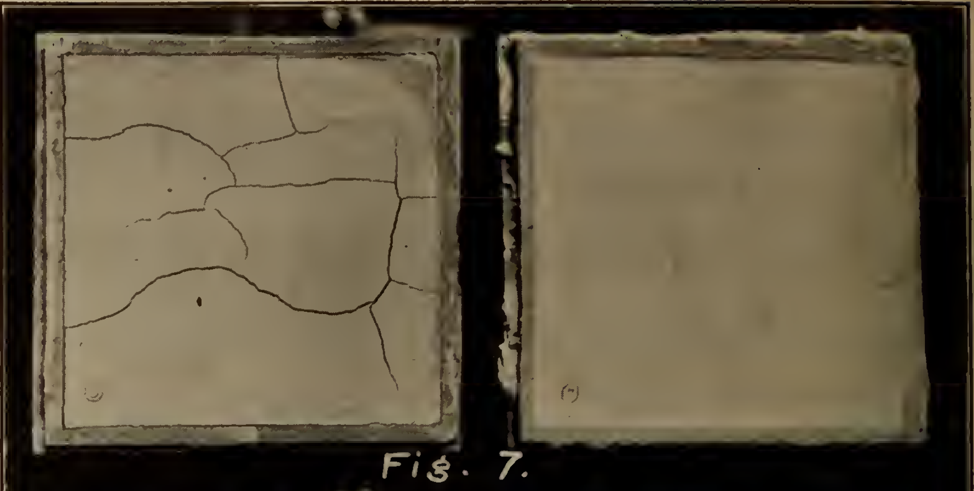
Fig. 7.

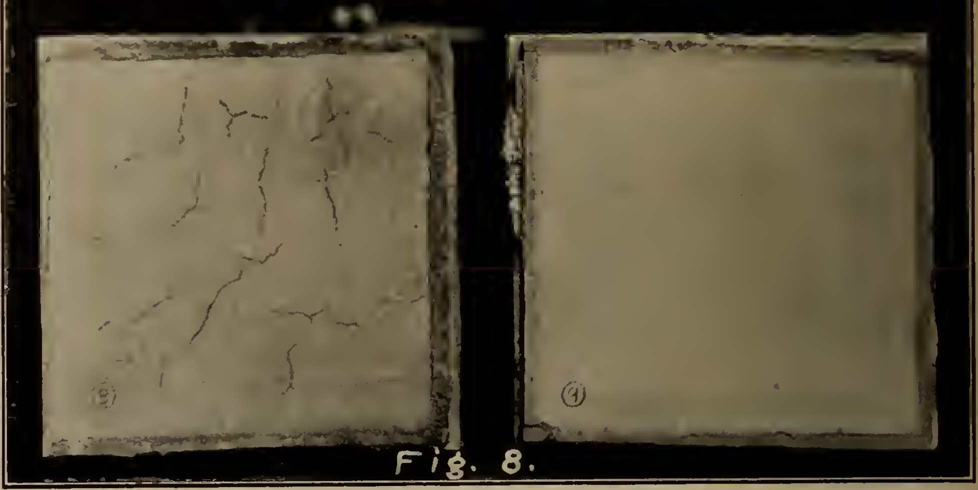
Fig. 8.

Fig. 7—Neat concrete slabs cured in moist closet; left, on dry porous base; right, on saturated porous base
Fig. 8—1:1 sand-mortar slabs cured in moist closet; left, on dry porous base; right, on saturated porous base

(3) An absorptive base tends to draw the cement and fine material away from the surface, leaving the larger aggregate above the general contour of finish.

(4) An absorptive base does not permit the batches to bond together properly, due to their stiffening on coming in contact with an absorptive medium.

(5) The tendency for slabs to check increases with the increase in the ratio of length or width to depth. A 20-ft. pavement would check to a greater extent than an 18-ft. pavement if the thickness remained the same.

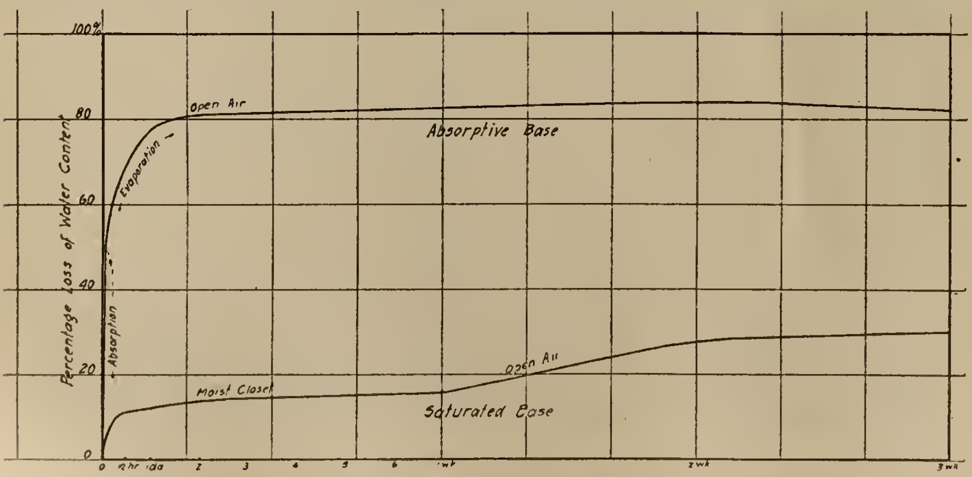

Fig. 9—Graphic representation of the effect of a dry porous base as compared with a saturated base, on a moisture content in neat cement mortars

(6) The richer the mix is in cement the greater the contraction, with an increased tendency to check.

(7) Extra wet mixes may help to prevent checking on moderately absorptive bases, but the resulting concrete is of low strength.

(8) With no loss of moisture the concrete tends to remain at constant volume.

(9) A saturated base prevents all losses by absorption and may even supply moisture to the slab to replace losses by evaporation.

Practical Suggestions

In making the results of practical application in road work, it is suggested that the procedure be somewhat as follows:—

On completion of a day's work the grade should be watered in preparation for the next day's work. Enough water should be placed on it and at such intervals so that it will not lie in pools or make the grade mucky. When the laying of concrete is commenced the area in front of the mixer should be well watered. This should bring about a condition close to saturation that would materially cut the losses by absorption. If the concrete materials are placed on the grade in front of the mixer it will be more difficult to follow the above procedure.

For the prevention of evaporation losses, dry covers such as tarpaulins laid directly on the concrete tend to aggravate the condition by absorbing additional moisture. Covers on frames may prevent the sun from increasing the temperature, but they will not stop evaporation. It is suggested that burlap strips be used, as has been done in some cases. They are 3 feet in width, of double-weight material and overlap each other. They are not as costly as tarpaulins and the actual cost of handling them is much less than moving heavy frames. They should be kept soaked with water and placed in that condition on the concrete when it has obtained a set, so that they will not mar it. These should be kept in a moist condition and not removed until just prior to covering the pavement with earth. If this procedure is followed a more uniform curing condition will result and at a time when the concrete is in greatest need of it.

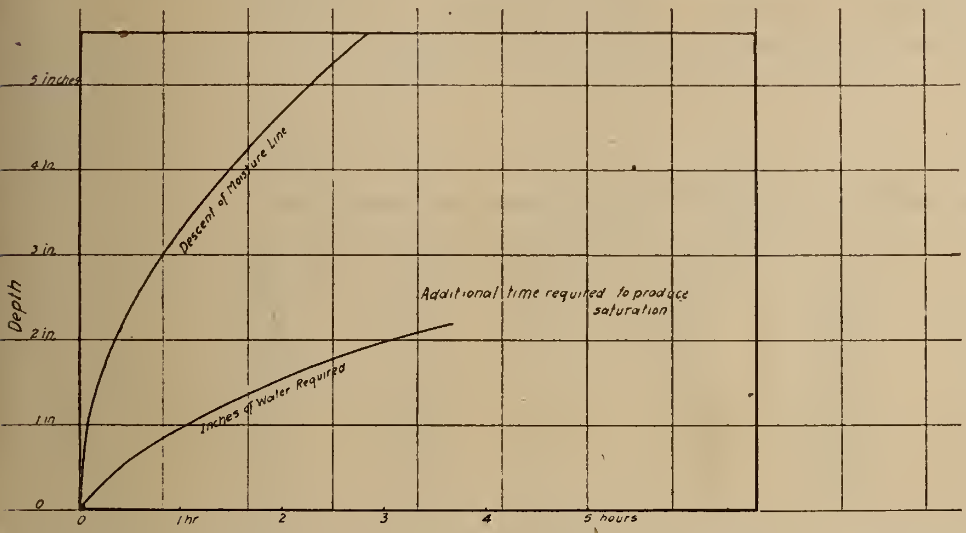

Fig. 10—Graphic representation of the absorption of water by dry pulverized clay used as basis for specimens in experiments

Some Details in Street Design

Large Aggregate in Asphalt Paving Increases Wearing Qualities—A Rough Base Course is an Advantage

In a paper recently submitted before the American Society for Municipal Improvements, P. L. Brockway, Wichita, Kan., U.S.A., outlined some very practical suggestions regarding street design. Some extracts from his paper follow:

Some engineers have thought that it should be possible to retain the very excellent qualities of the standard sheet asphalt wearing surface, and yet increase its resistance to internal flow, by adding larger, angular aggregate up to material passing a ⅜-in. screen without any other modification of the mixture. A surface was constructed along these lines four years ago, on a brick surface which had been practically destroyed by the concentrated heavy traffic leading to two ice and cold storage plants, a large planing mill and a freight depot. Asphaltic cement having penetration of about 45 was used There was used about half as much material over the ¼-in. and through the ¾-in. screen as would ordinarily be specified in the fine aggregate asphaltic concrete mixtures. Street temperatures ranging from about 0 to 125 deg. F. have been observed with standardized thermometers many times, the maximum being 137 deg.

Traffic counts indicate an average of 600 trucks daily or about 200 tons per foot width. In addition, heavy reconstruction of some of the plants has caused some very heavy loads of machinery to pass over it and heavy, vibrating construction machinery to stand in one place for weeks at a time. The pavement marks up some in extreme hot weather but has not yet developed any waves or general unevenness of surface. The same mixture has since been used on several other of our heavier traffic business streets having traffic counts up to 10,000 vehicles per day and only one serious wave was developed.

Another point in the construction of soft top pavement which is more pertinent than formerly is the degree of roughness of the base course on which the surface is laid. Many old pavements which were laid with rock aggregate so coarse that it was practically impossible to get an even contour, to say nothing of a smooth surface, are holding their own pretty well even under the punishment of greatly increased traffic. Other base laid with greater care in later years, and especially base laid without coarse aggregate having fairly smooth surface texture, has not fared so well. Examination shows that spots which give the greatest trouble from shoving of the wearing surface are above unusually smooth places on the concrete base. There was, therefore, developed a plan of artificially roughening the surface by marking across the base at intervals of about 18 in. by striking it with an inch rope when the concrete is still soft enough to be readily cut by the rough rope. The marks are made about ½-in. deep. This method has not been in use long enough to prove its merit but there is no question that roughening of some kind will be an advantage.

Another detail in pavement design which has proven very successful in the use of creosoted wood of 2-in. commercial thickness set with the grain vertical in transverse contraction or expansion joints in concrete pavement. Such joints have been in use twelve years without a single failure, without costing anything for maintenance and without the objectionable lump which so often develops.

In the biographical sketch of Mr. A. L. Harkness, which appeared in the "Canada's Engineers" series of Contract Record of October 31, page 1026, it was stated that he had been engaged in placing orders and supervising shipments of materials in connection with a large power house for the Shanghai Municipal Council, and also that he checked the reinforced concrete design and supervised the construction of the Drummond Court apartments, Montreal. Inadvertently the name of the Dominion Engineering & Inspection Company was not given as the employer of Mr. Harkness' services in these connections.

Construction Developments During the Month of November

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, November, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	1	$ 14,000	4	$ 285,000	....	$..........	....	....	5	$ 299,000
Churches	7	176,000	3	57,500	1	30,000	3	23,000	14	286,500
Factories	12	336,900	4	41,000	....	....	2	16,000	18	393,900
Public Garages	6	64,500	6	345,500	1	6,000	3	6,700	16	422,700
Hospitals	....	....	1	4,000	....	....	....	....	1	4,000
Hotels and Clubs	10	121,200	5	74,200	....	....	2	10,500	17	205,900
Office Buildings	9	158,500	2	10,500	....	....	....	....	11	169,000
Public Buildings	8	61,000	2	40,400	1	29,800	2	13,400	13	144,600
Residences	800	3,420,500	406	2,376,400	1	4,000	11	62,700	1220	5,871,700
Schools	7	247,400	3	108,700	....	....	1	6,000	11	362,100
Stores	33	283,000	5	38,500	1	50,000	1	7,500	40	379,000
Theatres	3	16,000	....	....	....	....	....	....	3	16,000
Warehouses	7	98,200	3	63,500	....	....	1	8,000	11	169,700
Total Buildings	903	$4,997,200	444	$3,445,200	5	$119,800	26	$153,800	1380	$8,724,100
Bridges	3	5,200	6	93,600	....	....	2	20,000	11	118,800
Dams and Wharves	6	580,900	7	52,500	....	....	3	18,600	17	660,400
Sewers & Watermains	15	169,500	2	19,000	....	....	3	6,400	20	194,900
Roads and Streets	34	1,167,600	6	425,000	....	....	....	....	40	1,592,600
General Engineering	7	436,700	3	2,090,000	2	118,400	2	34,400	14	2,679,500
Grand Total	968	$7,357,100	468	$6,125,300	7	$238,200	36	$233,200	1482	$13,970,300

Construction Contracts Awarded in Western Canada, November, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value.	No.	Value	No.	Value	No.	Value	No.	Value
Churches	1	$ 3,500	....	$..........	1	$ 1,500	....	$..........	2	$ 5,000
Factories	4	312,500	1	10,000	1	2,000	1	15,000	7	339,500
Public Garages	1	4,100	....	....	....	....	....	....	1	4,100
Hospitals	....	....	....	....	1	2,000	....	....	1	2,000
Hotels and Clubs	2	12,000	2	26,000	2	7,000	....	....	6	45,000
Office Buildings	1	2,500	....	....	....	....	3	32,400	4	34,900
Public Buildings	4	491,100	....	....	....	....	....	....	4	491,100
Residences	69	271,100	22	70,700	24	83,400	27	96,800	142	522,000
Schools	1	5,000	1	1,200	3	16,400	....	....	5	22,600
Stores	5	18,000	....	....	1	8,000	1	5,000	7	31,000
Theatres	....	....	....	....	....	....	2	9,000	2	9,000
Warehouses	3	23,000	1	1,700	1	6,000	....	....	5	30,700
Total Buildings	91	$1,142,800	27	$109,600	34	$126,300	34	$158,200	186	$1,536,900
Bridges	1	6,500	....	....	....	....	....	....	1	6,500
Dams and Wharves	2	15,200	1	15,000	....	....	....	....	3	30,200
Sewers & Watermains	....	....	1	5,300	....	....	....	....	1	5,300
Roads and Streets	....	....	....	....	....	....	2	35,000	2	35,000
General Engineering	1	4,500	....	....	1	43,500	....	....	2	48,000
Grand Total	95	$1,169,000	29	$129,900	35	$169,800	36	$193,200	195	$1,661,900

The Importance of Filter Sand and Gravel in Filtration Plants

On the Quality of the Purifying Media in Slow and Rapid Sand Filters Depends the Success of the Purification—Washing Controls Efficiency of the Plant

Bv A. O. TRUE

Before the North Carolina section of the American Water Works Association

It is probably impossible to state where or at what epoch sand was first utilized by man as a medium for purifying drinking water. Its use was known to the ancients, who undoubtedly observed, at an early date, the effective clarification of ground waters in their natural transit through sandy and gravelly substrata. It is a well known fact that the North American Indians had a regard for pure water. When necessity compelled, they would obtain water from shallow holes scooped in water-bearing sand, rather than draw their supply from a more accessible but muddy stream. The history of the use of sand, as a water purifying medium, is practically the history of water filtration, for the reason that while many other water filtering media have and are being used, such as coke, charcoal, porous plates and tiles, synthetic silicon dioxide and zeolites, their use has been relatively limited and usually for special purposes. The extensive practical accomplishments in water filtration have been obtained, over a period of nearly a century, by the employment of sand and gravel filtering materials. But it is not the purpose in this paper, to trace the history of water filtration, but to call attention to some of the more common physical properties of sand and gravel, and their relation to present methods in modern municipal water filtration practice.

Development of Sand Filtration

A few facts in relation to the development of water filtration will be sufficient to indicate the importance of the use of sand as a filtering medium.

The first water filter for the purification of a public water supply on a relatively large scale, appears to have been a filter constructed in East Chelsea, London, England, in 1829. It employed sand as the filtering medium. It was also the forerunner of the so-called slow sand water filter, many of which were put in operation in succeeding years in Europe, and were introduced into the United States about 48 years later.

The reduction in epidemic water-borne diseases, in those cities which pass their polluted river water supplies through a bed of sand, was so remarkable that this type of purification grew rapidly.

In 1885, however, the rapid or American type of sand filter for municipal water purification, made its appearance and was destined to have a wonderful growth, until today, probably three times as many people are supplied with water from rapid sand filters as from slow sand filters including the modified slow sand types.

It is unnecessary to inquire or discuss at length why this is so. The rapid sand method has been found more applicable and economical than any other in the purification of many of our surface water supplies, particularly those waters which sometimes carry large amounts of fine suspended particles.

The significant fact is, in relation to this subject, that, throughout the history of water purification, sand has been, and is, the accepted medium depended upon for freeing water from dangerous and objectionable impurities.

Valuable Qualities of Sand

The writer believes it has been demonstrated that natural quartz sand of the proper size, uniformity and purity is the most efficient filtering medium obtainable for water purification purposes. Among its desirable physical qualities for this purpose, the most important is indestructibility. It is practically unaffected by the elements and to no large extent by the physical conditions encountered in a filter. Water has no considerable solvent action on sand, nor is sand subject to any depreciation with the possible exception of a slight amount of abrasion from the contact of grains in the process of washing.

Perhaps next to permanency, the most valuable quality of sand as a filtering medium is its high specific gravity. This is an especially desirable and necessary quality in the modern type of rapid filter in which the filtering material must resist by gravity the rapid upward flow of wash water if it is to remain in the filter. The greater weight and resistance of the filtering material, as compared to the smaller dirt particles, constitutes the principle whereby it is possible to separate the sand from the impurities removed in filtration, and to discharge them quickly into the sewer. A relatively pure quartz sand has a specific gravity of about 2.6. The differential resistance of the sand grains and dirt particles, by virtue of their size and specific gravity will be mentioned again in connection with the conditons in a rapid filter when being washed.

Finally, sand is undoubtedly the cheapest of all materials which may be satisfactorily used as a filter material. There are many natural deposits of sand, suitable for filter purposes. These are fairly well distributed as to make natural filter sand available to our centres of population without excessively long hauls.

The three desirable characteristics of sand, and also gravel, as filtering media, namely, permanence, freedom from depreciation, high specific gravity, and availability at low cost, are readily appreciated by all charged with the design and operation of filter plants.

Troubles With Sand

Sand is not a perfect filter medium in rapid filtration, as at present practiced. Some troubles are reported from the majority of filter plants, which indicate that filter sand has some qualities which render the process less efficient than would otherwise be the case. Whether these difficulties may be attributed to inherent qualities of the sand as distinguished from other filtering media, and if so, to what extent, are questions which cannot be answered conclusively at the present time. The troubles referred to are the tendency in some filters to vertical stratification of the sand after washing, the formation of the so-called "sand balls" and "mud balls" in the upper portions of the sand bed, and the recently reported under-water shrinkage of sand beds.

The consensus of opinion seems to be that the sand ball and mud ball nuisance is attributable not to the sand itself, but to inefficiency of coagulation and the failure of the wash water system to expel and carry away the impurities from the sand surface by the wash water. The shrinkage, under water, of sand beds in rapid sand filters has been reported, as far as I can learn, in only a very few instances. Some observers report the actual drawing away of the sand bed from the supporting walls of the filter to the extent of a fraction of an inch, and for a considerable depth; with the result that imperfectly filtered water reached the under drains of the filter. Studies in the chemistry and physics of colloids seem to show that many granular substances in the presence of water are subject to an internal force affecting the intergranular spaces and causing a shrinkage of the substance. Clay is a good example of such a substance, and some sands appear to possess this quality. Observation of sand beds with reference to under-water shrinkage, and the best means to prevent or overcome it will be extremely important if it is shown that this phenomenon is of frequent occurrence.

Importance of Filter Washing

Probably the two most important operations in rapid sand filtration are coagulation and filter washing. They are also the most difficult to control to get best results.

It is an axiom of rapid sand filter operation that filter materials efficiently washed and graded will filter evenly and efficiently and vice versa.

The conditions in a filter, when washed by vertical reverse currents, are familiar to operators. The whole sand bed assumes a semi-fluid, non-resistant condition, due to the dispersion of the sand grains in the wash water stream. A test rod dropped into a filter being washed sinks readily and stops only on reaching the undisturbed supporting gravel at the filter bottom. The dirt accumulated by the filter, together with the coagulant making up the dirt layer on the sand surface, is broken up and dispersed by the upward stream. These dirt particles, being for the most part lighter than the sand grains, are carried upward and beyond the sand, then laterally into the wash troughs and sewer. The smallest sand grains however, under a vertical velocity of water not to exceed 24 inches per minute will rise only about 18 inches, and should not reach the wash trough.

The process is one of rejection of the dirt and retention of the sand by virtue of the selective action of the wash water stream. Two important physical conditions make this separation possible. First, the fact that the dirt is for the most part lighter than the sand, and second, because the dirt particles are smaller than the sand grains and therefore offer less resistance to the washing current.

Since the weight of a particle increases approximately as the cube of its diameter, while its projected area, and consequent resistance to a stream of water, increases only as the square of its diameter, the finer sand grains are carried higher in the upward wash water stream, to points where the latter decreases in velocity. If this is true, it is reasonable to conclude that very fine particles of dirt, or foreign matter, which are as heavy as the filter sand, are carried into the sewer by the ordinary rates of rapid wash.

As the wash water is shut off from a filter unit, the suspended sand bed immediately begins to settle down to its natural position on the supporting gravel in the filter bottom. As this occurs, the law just mentioned with reference to weight and surface resistance again comes into play and tends to cause the largest sand grains to settle most quickly. The result is that, in the absence of distributing currents, the sand bed stratifies in horizontal layers increasing in fineness of sand grains from the bottom to the sand surface. This places the coarsest sand at the bottom and the finer grains at the top. A bed in this condition offers equal resistance to the flow of the water in the filtering direction and yields the most efficient filtration. The slow closing of wash water values probably aids in permitting this horizontal stratification of the sand.

Sand is a highly porous material, and a large percentage of the volume forming a sand bed is, of course, space between the grains. In dry sand these spaces or voids amount to from 30 to 40 per cent of the cubical volume.

Air in the Filter Bed

If for any reason a filter is drained, the voids in the sand bed become wholly or partially filled with air. It is well known that a filter will operate most satisfactorily when these voids are completely filled with water, and that air in the filter bed is troublesome, and in sufficient quantity will completely stop the flow of water through the sand. Another source of air lodging in the intergranular spaces is the water passing through the filter. Under certain conditions of temperature and lowering of pressure, this air separates from the water. In some plants this occurs with sufficient frequency to constitute an annoying feature of operation. The only remedy seems to be careful displacement of the air by a reverse current of water. This raises and fractures the dirt layer and undoubtedly disturbs the efficiency of the filter unless the unit is washed before being again placed in operation.

The sand bed in a modern rapid sand filter is from 24 to 30 inches in depth. Best results seem to be obtained with sands of effective sizes from 0.35 mm. to 0.45 mm. The uniformity coefficient should be not far from 1.6. If the units are arranged for rapid wash the sand surface should be at least 20 inches below the lip of the wash water troughs.

The coarse-grained layer supporting the filter sand is usually referred to as the gravel. There seems to be no set rule as to the diameter below which stone particles are termed sand and above which they are termed gravel. Generally speaking, material 1/8 inch in diameter and smaller is classified as sand and larger diameters gravel.

In the older air and mechanical wash type of rapid filters the gravel layers are 8 to 12 inches in depth. In the newer rapid water wash type, the gravel bed is about 18 inches in depth. It is usually graded in several horizontal layers from coarsest at the bottom next to, or surrounding, the strainer system to the finest at the top and directly under the sand bed. These layers average some 3 1/2 inches in thickness, the bottom stones being 2 to 2 1/2 inches in diameter and the top layer of gravel being about 1/10 inch in diameter or smaller.

Reasón for Thick Bed of Gravel

The purpose of this thick bed of graded gravel is three-fold. First, to furnish a support for the filter sand, which will prevent the latter from being washed into the strainers. Second, to allow the clear water to pass freely and uniformly from the filter to the underdrainage system when filtering. Third, and most important, to distribute the wash water across the entire horizontal section of the filter and to deliver it evenly and without eddies to the sand bed. Eighteen inches of gravel of the sizes mentioned above have been found sufficient to resist the upwards force of the wash water when applied at a rate of 15 gallons per square foot per minute, without danger of "blow-ups" or the breaking through of the gravel and a consequent intermixing of the gravel and sand. It would appear that higher velocities of wash water than 15 gallons per minute, equivalent to 24 inches vertical rise per minute, would seldom if ever be necessary. Higher velocities would probably require special arrangements in filter design to prevent loss of sand into the wash troughs. It is questionable if wash water rates higher than 24 inches per minute would be economical.

Every operator should appreciate the necessity of uniform and thorough washing of the sand bed of rapid filter units. As already stated the efficiency of filtration depends upon this. The gravel bed plays an important role in securing uniform washing and the consequent settling of the filtering materials in uniformly graded horizontal layers. To obtain these results it is important that the gravel layers be carefully laid, that uniform sizes of stones be secured and level layers of uniform thickness for each size. Only in this way can such a bed be laid as to offer equal resistance to the rising wash water at all points over the horizontal area of the filter bottom.

How Should Lime Plaster Be Applied?

Standard Specifications Covering Two and Three Coat Plaster on Wood and Metal Lath

"Standard Specifications for Lime Plaster" is the title of a bulletin just issued by the National Lime Association. This bulletin is the result of several years study of field conditions and has been prepared in conjunction with representatives of the engineering and architectural professions as well as expert plasterers and producers of lime.

The specifications are in such form that they may be quoted directly and included in an architect's complete building specifications, or, if desired, the short form, also included, may be used and the contractor referred to the standard specifications.

The standard specifications are as follows:

General

1. The contractor shall furnish all necessary tools, scaffolds and other appliances needed to fulfill the requirements of this contract, all scaffolding to be erected and maintained in accordance with the laws of the state, province or municipality having jurisdiction.

2. All interior walls and ceilings where other finish is not required shall be plastered (two coats, three coats) unless otherwise specified (here describe extent of work.)

3. Plastering may be omitted back of marble, slate or soapstone wainscots that are backed up with concrete or masonry.

4. Stud partitions back of marble, tile, slate or soapstone wainscots shall be lathed and plastered one coat, (except where spaces are filled with brick or terra cotta).

5. The finish coat of plaster may be omitted from plastering behind wood wainscots or baseboards.

6. All putty made from quicklime and used for scratch or brown coat work shall be allowed to age without drying out for at least three (3) days, or if sand is added, the mortar shall be stacked at least three (3) days before use.

7. The use of open salamanders is forbidden.

Materials

8. Quicklime for plastering shall be of first quality, fresh and properly burned, and shall be such as to satisfy the current specifications of the American Society for Testing Materials, as well as the local, state, province or national laws.

9. Hydrated lime shall be of such quality as to satisfy the current specifications of the American Society for Testing Materials.

10. Sand shall be clean and of angular grains and shall be well graded. It shall all pass through a number eight (8) sieve. It shall be free from loam, clay, etc., in excess of ten (10) per cent, by volume, and shall be entirely free from vegetable or animal matter.

11. Hair shall be clean, long, goat or cattle hair, free from grease and shall be well beaten and soaked before incorporating. Vegetable fibre at least two (2) inches long may be substituted for hair.

12. Clean, fresh water only shall be used.

13. Wood lath shall be of No. 1 quality and of such length that joints will be made on studs or furring strips.

14. All metal or wire lath shall be (enameled, painted, dipped, galvanized).

15. The minimum weight of metal lath used shall be

	Without Ribs	With Ribs
On walls	2.2 lbs. per sq. yd.	2.50 lbs. per sq. yd
On ceilings	3.0 lbs. per sq. yd.	3.00 lbs. per sq. yd.

Application and Workmanship

16. All wood lath shall be nailed to each stud, beam or furring strip with 3d 16-gauge wire nails driven flush. Joints in lathing shall be broken at least every eighth course. Lath on walls shall be laid horizontally, and on ceilings shall be run in one direction only. A full three-eighths (3/8) inch key shall be provided between lath.

17. Metal lath, wire cloth or other metallic lathing shall be stretched on application and securely stapled or attached to all studs or furring strips so as to provide a rigid base for the plaster. All vertical joints shall be made on supports. Metal lath shall be securely tied with annealed wire at least once between supports along horizontal joints. Laps shall

be made in accordance with the instructions of the manufacturer.

18. If the wood lath has become dry before plaster is applied it shall be well wetted just prior to the application of the plaster. No free film of water on the surface, or drops along the edge of the lath shall be present when the plaster is applied.

Two-Coat Lime Plaster on Wood Lath (Doubled-Up Work)

19. The mortar shall be a mixture of lime paste or putty, prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least three (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two Coat Doubled-Up Lime Plaster on Wood Lath

First Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
Hair or fibre	1 part by volume
1 part by volume	3 parts by volume
2 parts by volume	
1½ bu. per cu. yd. of sand	

Finish Coat

For various finish coat proportions, see section 49.

20. Plastering shall be five-eighths (⅝) inch grounds.

21. Apply a coat of first coat mortar with sufficient pressure to make a good key at the back of the lath, then bring out to grounds by doubling up on this coat. Use rod and darby to bring to a true, even surface ready for the finish coat. When this coat is dry apply the finish coat.

22. For finish coat specifications, see section 49.

Two-Coat Lime Plaster on Brick, Tile, Gypsum Block, Etc. (Doubled-Up Work).

23. The mortar shall be a mixture of lime paste or putty, prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two-Coat Doubled-Up Lime Plaster on Brick, Tile, Gypsum Block, Etc.

Bond Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
1 part by volume	1 part by volume
2½ parts by volume	4 parts by volume

Finish Coat

For various finish coat proportions see section 49.

24. Plastering shall be to five-eighths (⅝) inch grounds.

Note. Mortar joints of walls to be plastered shall be cut flush. (Include in specification for brick works.)

25. (a) The surface of the wall shall be swept clean, and shall be free from oil, grease or soot.

(b) All masonry surfaces shall be well wet before plastering, but there shall not be a surface film of free water present when plastering begins.

26. Apply a one-quarter (¼) inch coat of mortar with sufficient pressure to secure a good bond to the masonry, then bring out to grounds by doubling up on this coat. Use rod, darby and float to bring to a true, even surface ready for the finish coat. When plaster is dry, apply the finish coat.

27. For finish coat specifications, see section 49.

Two-Coat Lime Plaster on Concrete

28. The mortar shall be a mixture of lime paste or putty, prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least three (3) days, or hydrated lime, with sand, etc., in the following proportions:

Proportions for Two-Coat Doubled-Up Plaster on Concrete

Bond Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
1 part by volume	1 part by volume
2½ parts by volume	3 parts by volume

Finish Coat

For various finish coat proportions, see section 49.

29. Plastering shall be to five-eighths (⅝) inch grounds.

Note. Concrete surfaces to be plastered shall be cast in rough forms so as to provide as good a bond as possible for the plaster. (Include in specifications for concrete work.)

30. If the concrete surface is smooth or glazed or out of wind it shall be hacked or roughened so as to provide a suitable mechanical bond, or 10% by volume of portland cement shall be added to the bond coat mix. Just before plastering, the surface shall be wire brushed and swept clean, and shall be free from oil, grease or soot. The concrete shall be practically dry, but if bone dry shall be moistened with a brush, shortly before plastering starts. No mortar shall be applied to wet or frozen concrete.

31. (a) Apply a one quarter (¼) inch coat of soft mortar with sufficient pressure to secure a good bond to the concrete. Before this coat has hardened it shall be deeply doubled scratched.

(b) When bond coat is hard, but not dry, bring out to grounds with brown coat mortar. Use rod, darby and float to bring to a true, even surface. When this coat is dry, apply the finish coat.

32. For finish coat specifications, see section 49.

(To be Continued)

R. J. Marshall Addresses Toronto Branch, E. I. C., on Testing of Materials

A comprehensive and informative address on "Inspection of Materials" was delivered at the regular weekly meeting of the Toronto branch of the Engineering Institute of Canada last Thursday by R. J. Marshall, president of the Canadian Inspection and Testing Company, in which he capitulated the standard specifications along with methods of test and analysis, and explained the interdependence of inspector, contractor, engineer and vendor in the work involved in any construction.

"Specifications are the working tools of inspectors," Mr. Marshall said, "and, in writing, these should be clearly worded, for the reason, among others, that the inspector may know just what is called for when testing and inspecting the materials." Inspection comprised three processes—visual inspection, actual external inspection, and internal inspection.

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Building Ahead of Last Year

The total awards for Canadian construction for the month of November, according to MacLean Building Reports, Limited, were $15,632,200, compared with $30,078,100 in October, and $21,453,900 in November, 1922. Residential building accounted for 42.8% of the November total, amounting to $6,692,700. Business building amounted to $2,834,900, or 18.1%; industrial building, $733,400, or 4.7%; and public works and utilities, $5,371,200, or 34.4%. The activity was distributed among the groups as follows: Ontario, 47.1%; Quebec, 39.2%; Western, 10.6%, and Maritime, 3.1%.

Construction awards for the year to date amounted to $292,746,800, compared with $259,371,400 during the corresponding period of last year, an increase of 12.8%. During this period residential building shows a falling off of 6.6%, compared with last year; but continues as the most active type of construction, while business, industrial and public works and utilities show an increase of 3.4%, 12.4%, and 53.1% respectively, over the same period. The activity was distributed among the groups as follows: Ontario, 48.5%; Quebec, 33.4%; Western, 15.2%; Maritime, 2.9%. The Maritime and Western sections are the only divisions to display less activity than last year.

There is no ground for pessimism in so far as the business outlook is concerned, is the comment of MacLean Building Reports when submitting these figures. Canada's position is fundamentally sound and the course of business is distinctly on the upgrade. The agricultural community, which has borne the brunt of post-war adjustment and deflation, is now in a much more healthy position as a result of this year's bumper crop. The influence of this improvement will be far reaching, for practically every line of business in Canada is closely allied or dependent upon agriculture. Leading industries have experienced a fairly profitable season. Labor has been well employed. Weekly bank clearings testify to heavier movements of goods. Railways earnings appear to better advantage. In some spots business is poor, but, regarded as a whole, is in fair volume, and conditions warrant constructive policies.

It is evident that 1924 will witness considerable building activity—probably involving an expenditure of three hundred million dollars in the construction field. Much speculative building activity has been eliminated in favor of investment buildings and other high-class structures, while considerable activity may be expected in the engineering field. Building material prices and the labor situation seem to be fairly stable, and it is expected that in 1924 there will only be a slight recession in building costs.

Opportunities that Canada Offers

Are there no inducements that will keep Canadians from emigrating to other countries, particularly the United States, in an effort to better their condition of livelihood? One would almost think so, judging by the numbers of people that have been emigrating from this country since a few years back. It is said that this year Canada's population has actually decreased because of the greater number of persons leaving the country than of those entering it. At any rate, it is certain that in many classes of workers, the ranks have been seriously depleted by a tremendous exodus to the United States, where a labor shortage and, consequently, high wages have offered strong inducements. The extent to which the movement has gone may be appreciated from a statement made a few days ago by a prominent Toronto labor official who stated that twenty-five per cent. of our skilled mechanics had left the country. Surely the situation, if such is the case, demands urgent remedial measures—something more than just a mere appraisal of the conditions and letting it go at that.

To our mind, it has largely been a case of "distant fields looking green." While many Canadians have gone to the United States and stayed, there are thousands whose bubble of hope has been pricked and who are now clamoring to return to this country after brief but sorry experiences in distant cities. What has been responsible for sending these citizens of ours to the United States in the hope of better employment at higher wages? Sir John Willison says it is the strain of pessimism that runs through the current of Canadian life. In an address last week, he stated that "all down the pages of Canadian history one finds the trail of the pessimist. This spirit produces a very unfavorable effect upon the Dominion as a whole and has done much to retard progress during the past half century." He claims that the Canadians who have remained at home have done just as well as those who left to obtain their livelihood elsewhere.

Whether one can call it pessimism or not, the fact seems to be that in many respects Canadians do not boost their country as they ought. Verbal expressions of boasting, in which they freely indulge at times, are just platitudes,, unless action accompanies the word and it is in the action that they frequenty fall down. Rosy promises of higher wages and they leave the country! Roger W. Babson told us a few days ago that Canadians are not "sold" on their country. He, an American, had such abounding faith in Canada and in its future that he characterized the movement of population away from the country as nothing less than a shame. And he is not far out, we think, in his surmise. We have here in Canada a heritage such as few countries can approach—a heritage of resources that is a guarantee of Canada's future greatness. The realization of that should be brought home to every citizen of the Dominion so that the spirit of optimism will replace the strain of pessimism that is now coursing in the veins of many a Canadian. Canada can offer just as big inducements to the young man as can the United States—perhaps bigger. Just let him appreciate them to their full measure and he will not care to go to foreign lands in search of the fulfillment of his ambitions.

Walls of Building Erected Horizontally

A Scottish architect, speaking on new methods of building stated that perhaps one of the most interesting new methods of construction was that in which the walls were formed on the ground, lying on the flat, hinged at the base, and then raised to the perpendicular by means of winches. The expense and danger involved, however, did not justify the result, according to the architect. The late T. L. Watson, at one time a director of the Royal Technical College, Glasgow, improved on that system by forming the walls also on the horizontal, but hinged along the center of gravity of the walls, and in that way deleted entirely the use of machinery.

The underlying principle was the discarding of moulds or blocks in wall construction. The walls of the house were formed on horizontal platforms a few feet above the ground, and hinged as nearly as possible along the center of gravity, so that when the concrete had set each wall was turned over on its hinges into the exact position. As the platform in its horizontal position balanced in the middle, due allowance being made for door and window openings, it followed that the lower half of the wall, in descending, automatically raised the upper half. No force was required and no apparatus employed (other than rope). The platform was adjusted to its vertical position before the concrete was applied, and the wall naturally assumed its destined place with accuracy.

The door and window frames were laid down on the platform before the concrete was filled in, so that the house was then ready for its roof and internal finishings. The platforms were formed of the roof spars and boarding, and the greater part of the material was, therefore, on the site and ready for use. The time taken to erect the four walls after the concrete had set was only one and a half hours.

The Week's Developments in a Nutshell

The event of the week is, of course, the practical rejection of a protection policy by Great Britain. The effect on Canada will work both ways. Competition in our export trade will be keener. On the other hand a large number of Canadian industries, as, for example, the cotton and woollen industries should profit. British competition in this latter industry has had the effect, during the last few months, of reducing Canadian operating profits almost to the vanishing point.

Another effect will be the more aggressive attitude a new government is almost certain to take towards the Franco-German situation. This may be a blessing in disguise. If the continental situation could be improved it would probably more than compensate Canada for any losses she sustains through the rejection of Baldwin's tariff plans.

Retail trade throughout the Dominion has been slower than expected on account of the very mild weather. On the other hand this very condition means almost fully employed labor, savings in fuel and an ultimate greater spending capacity.

The annual reports of many industries are now coming through and, in the main, are better than a year ago. Such lines as flour, milling, iron and steel, building and general construction, both small and large manufacturing, are all in better shape than a year ago. An example is the Dominion Bridge Company which last year earned less than one per cent on its common stock; this year the dividend of four per cent has been earned with a fair margin over.

An announcement of great interest to the building and construction ndustry is to the effect that British capital to the extent of some six miliion dollars is assured to Calgary next year in connection with elevators, milling, &c.

Hints for the Contractor

Method of Releasing a Mired-Down Caterpillar Shovel

A simple and quick method of getting a 55-ton caterpillar-mounted revolving shovel out of a mud hole is described in a recent issue of The Excavating Engineer as follows:

Ordinarily a shovel has sufficient tractive power to pull itself out of ordinary sink holes with the help of planks, timber and brush, but occasionally the operator may, as this one did, find himself up to the top of his caterpillars in particularly tenacious mud. In this instance one of the caterpillars was all but buried.

Cribbing was placed alongside the low caterpillar. The shovel was swung around and by means of the power boom hoist, the boom was lowered on this cribbing, at the same time the dipper was thrust out as far as it would go.

This cribbing then acted as a fulcrum and the caterpillar was lifted up and planks and timber thrown underneath. More cribbing was added and the caterpillar was free. This fulcrum and lever arm action may be increased by loading the dipper.

Setting Forms on Vertical Curves for Concrete Paving

Regardless of the nicety of the finish on a concrete road it will not possess desirable riding qualities unless the form setting is good. Little trouble is experienced in getting a satisfactory job on tangents and on straight grades. But vertical and horizontal curves frequently present difficulties to the form setter, as is evidenced by many completed jobs in which practically all curves, horizontal as well as vertical, consist of a series of angle points joined by chords. This is especially true of vertical curves, where poor form setting is not noticeable to the eye, but where it is, however, decidedly deficient in riding qualities.

On tangents and on straight grades stakes should be set with a transit every hundred feet to line and to grade. Intermediate stakes can be set with sufficient accuracy by means of Swedish T-stakes. Where vertical curves are circular and not parabolic, the following method has been found extremely practical and simple of application. When correctly applied perfect vertical curves will result. The method is described by R. E. Behrens in "Engineering News-Record."

On vertical curves stakes should be set to grade every 50 ft. with an instrument. The form setter then determines by means of his T-stakes and an ordinary rule how much the 50-ft. stake is above or below the two adjacent 100-ft. stakes (regular stations), depending upon whether the curve is a "crest" or a "sag."

Fig. 1 represents a "crest." Here the form setter will "T" between Sta. 8 and 9 showing that the grade stake at Sta. 8+50 is 5 in. above a straight line from Sta. 8 to Sta. 9. Call this distance "A." He will then stretch a chalk line tightly to grade between Sta. 8+00, 8+50 and 9+00. At the 25-ft. points, i.e., at Sta 8+25 and 8+75 he will set auxiliary grade stakes, the grade points of which will be ¼ of "A" or 1¼ in. above the chalk line. Raising the chalk line to the points at the 25-ft. stakes will reveal the outline of the vertical curve. However, his final step will be to raise his forms by ¼ of 1¼ in. or 5/16 in. above the chalk line at each 12½ ft. point. If the engineer or the inspector on the job will furnish the form setter with the value of the distance "A" it will save him the operation of "T"ing between the Station stakes. "A" can readily be computed from the plan elevations.

Fig. 2 represents a "sag" or a "trough." Here, again, stakes are set to grade by instrument at Sta. 16+00, 16+50 and 17+00. The form setter by the use of his T-stakes has determined that Sta. 16+50 is 4 in. ("A") below a straight line from sta. 16+00 to Sta. 17+00. After stretching his chalk line tightly from Sta. 16+00 to 16+50 and from 16+50 to 17+00, he allows it to drop or sag by an amount equal to ¼ "A" or 1 in. at the 25-ft. point. The chalk line will then show a perfect vertical curve, and the forms can be set directly to the line.

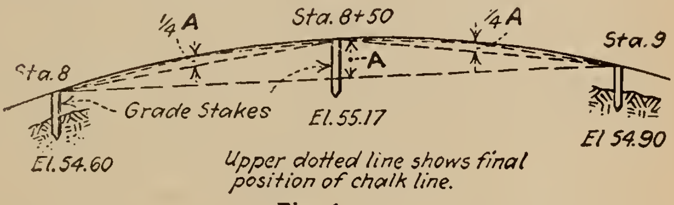


Fig. 1

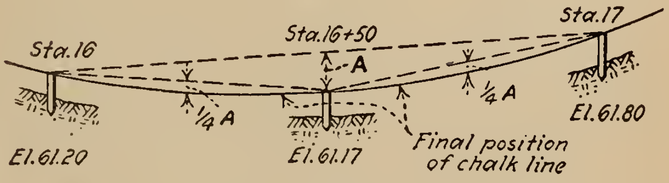


Fig. 2

Method of form setting on vertical curves

The above method of measuring mid-ordinates can be used equally well on horizontal curves.

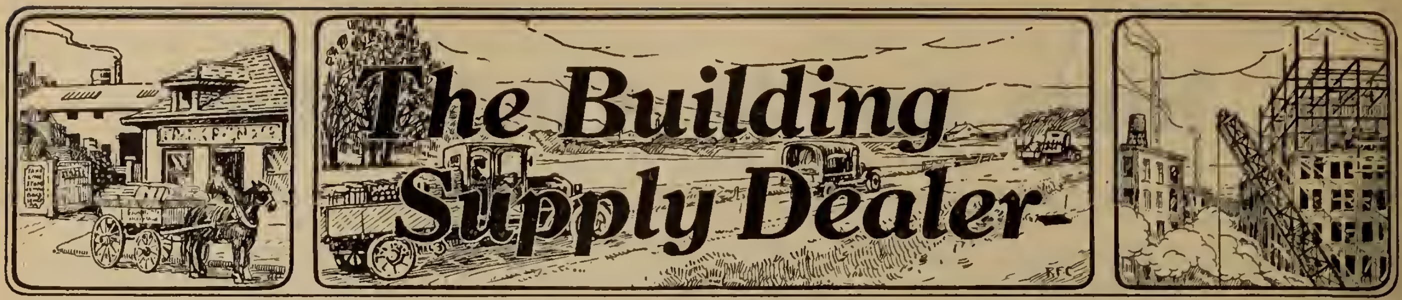
When once thoroughly explained and demonstrated to a form setter, the latter will pride himself with possessing a "system" and better form setters will result.

Trade Incorporations

A recent registration at Montreal was that of Stonger, Thompson & Co., to carry on an engineering and contracting business. Messrs. Stanley Stonger and Cecil Thompson are the principals.

Obituary

Mr. George L. Rainboth, aged 39 years, an engineer in the Department of the Interior, Ottawa, died recently from injuries sustained when he was struck by a motor car in that city recently.



Should Building Supply Dealers Have a Credit Bureau?

Exchange of Ledger Experience Through a Central Organization Would Put Business on a Sounder Basis

The utilization of ledger experience has had the effect of creating a strong co-operative spirit among business men in all trades and industries where it has been put into practice. There is no credit information more eagerly sought, nor in which the business man, or his credit man, takes a more intense interest than in ledger experience. The tendency on the part of merchants and manufacturers who work to achieve the common object of reliable credit information, is to organize in associations, bureaus and the like, and this has brought to light the dependence which each must place upon the other, and the splendid results of such dependence. It has had another and equally valuable effect, and that is to make men in business entertain closer and friendlier relations with each other, thus inducing expressions of that complete confidence essential to thoroughly developed and elevated business standards and morals. Thus does G. W. Hafner explain in "Building Supply News" the value of a credit bureau for building supply dealers. The details of such a scheme he outlines as follows:

Reliability of Credit Information Biggest Difficulty

Now, the main cause underlying the establishment of credit bureaus of this kind is the difficulty of determining accurately the reliance to be placed upon general credit information, such as is furnished by the commercial agencies, for instance; or, on the other hand, such as any man in business is able to obtain single-handed. This applies with peculiar force to the retail building supply and lumber business, where sales are made to contractors and others, many of whom are not listed in the rating books of the agencies. It is the opinion of those engaged in credit work that there should be some substantial accessory to the mercantile-agency information.

Such conditions as these have called credit interchange into being. It is a credit-clearance system. Its aim is to locate the individuals or firms with whom a customer is dealing; and, having found them, to institute an investigation as to the standing upon their books of the applicant for credit. Such an investigation is generally very extensive, affording a mass of reliable information.

Dealer in Position to Give Information

Any building supply dealer is in a position to provide information of a vital character in regard to the standing of the people to whom he sells. He can tell whether a man is prompt or slow in his payments; whether he shows a disposition to pay his bills or not; whether his general methods indicate that he has a fair understanding of good business methods; or, on the other hand, whether he shows a tendency to sharp practice and is unsatisfactory and troublesome.

When business men organize their own credit bureaus there is no necessity for anything more than nominal, and, in most cases, no capitalization. The information is furnished voluntarily by the members of the bureau; and the clearing of such information to interested members should require but two or three competent clerks, depending, of course, upon the number of co-operating members. No supervision should be required after the methods are designed and put into operation, since the procedure in all cases is practically similar—in fact, a good credit interchange system is essentially automatic in its workings.

Maintaining Bureaus at Lowest Cost

This means that the amount of expense to be borne by each individual member of the bureau would be extremely low. Now, this question of expense is a very important one, and has a vital bearing upon the success of any credit-interchange bureau, for the simple reason that if the cost is small, the willingness of material and lumber dealers to avail themselves of the service will be more pronounced than if the expense entailed be an onerous one. While this would not apply so much to the larger concerns, it nevertheless has a very decided bearing on the ability of the vast majority of dealers to use the service. It is, of course, unnecessary to state that the success of your plan depends almost entirely upon the universality of the support given it—that is, assuming a workable, practicable plan to start with.

The Working of a Credit Bureau

To give you a general idea of the workings of a credit-interchange bureau of the kind you evidently have in mind, it may be stated that a good plan is substantially as follows:

An office is established in charge of a secretary or clerks. The names of the dealers desiring to participate are listed and a number assigned to each concern. Printed copies of the list are distributed, so that each member will know his own number and also be able to identify any other concern by its number whenever the latter shall appear upon communications sent to him. Each member is supposed to submit to the office a list of all his customers. A card is made out bearing the name of each customer. Upon this card is entered the numbers representing the concerns who are selling to this particular customer.

Let us assume that the Jones Building Material Co. has received an order for $500 worth of material from John Smith, contractor, and Jones decides to investigate the general standing of Smith before delivering the order. He therefore sends to the office of the credit bureau an inquiry ticket, upon which he enters the name of John Smith.

The inquiry slips are entered upon report sheets; one sheet being made out for each member whom the cards show has been dealing with any of the names listed, and the report sheets are delivered to the interested members by mail or messenger. The interested member is supposed to enter opposite the names appearing on the sheet statements of his experiences. The information generally asked is the amount owing, the amount overdue, the manner of payment, and any remarks that the concerns reporting consider necessary or advisable to make. The manner of payment is generally indicated by symbols.

This is, of necessity, the barest outline of a comprehensive plan, and, of course, you realize that the forms necessary to carry out this idea must, first of all, be drawn up and printed, and that the machinery of the plan must be set in motion by some individual who knows what he is about.

Educating Architects Regarding Building Materials

Committee Representative of Interests Concerned Seeks to Establish a Structural Service for Architects and Engineers

In July last, at the suggestion of the president of the Ontario Association of Architects, manufacturers interested in the production of building materials were invited to confer with the architects at their annual convention, with the object of developing a closer relationship so as to provide for the more extensive use of Canadian building materials. The proposal met with an enthusiastical response, it has since been endorsed by the Royal Arichitectural Institute of Canada, and those who are in a position to speak on behalf of the Engineering Institute are equally sympathetic. A committee has been organized representative of architects and manufacturers and at the request of this committee a circular is being distributed by the Canadian Manufacturers' Association for the benefit of those who are concerned in the production of building materials. This circular explains the work in mind as follows:

The committee proposes to follow the lines of what is now an established and recognized method in use by the structural service committee of the American Institute of Architects, on which producers are represented. This structural service committee has developed a standard filing system for all advertising material sent by producers to architects and engineers, it tenders advice to advertisers in respect to subject matter in which architects and engineers are interested, and supplies information respecting tests and other scientific data relating to building materials.

The Canadian committee desires that all Canadian producers of building materials who seek, by advertising, to interest architects and engineers, should give immediate consideration to this proposal under the following headings:

(a) That advertising matter for distribution, such as catalogues, descriptive booklets, pamphlets, etc, conform to what has now become almost universally recognized as standard size, viz., 8½in. by 11 in.

(b) That the subject matter either by description or illustration, tell the architects and engineers what they need to know in order to convince their clients of the merits of the product or to introduce it properly into their specifications.

(c) That information respecting authoritative tests, standardization, or simplification be developed and published to the architects and engineers.

The standard size for catalogues has been generally accepted although not necessarily followed, but the Association of Canadian Advertisers and the Canadian Purchasing Agents' Associations as well as a number of associations in the United States, have laid it down as good practice, so that it now remains for what has almost come to be considered as general agreement, to be universally followed. This permits of filing in the offices of architects and engineers and if dates of issue are stamped on all such matter the members of these professions eventually will have an authoritative, loose-leaf, comprehensive catalogue of Canadian building materials. The American Institute of Architects issues an indexed classification for all such material and it is the aim of the Canadian committee that we should in a short time be able to build up a similar structure in Canada.

Having regard to paragraphs (b) and (c) above, it is submitted that these are subjects which should be taken up by interested trade associations. Standard specifications are now used in some lines of manufacture. This is information in which the architect and engineer are especially interested. They need information of this kind in order to sell your product to their clients.

Some trade associations are already developing data, others will take it up shortly. The co-operation of all manufacturers of products wherein the architect or engineer is part of the chain of distribution is desirable in order to overcome certain well-known disadvantages we labor under through our close proximity to a highly organized industrial nation.

November Building is High in Winnipeg

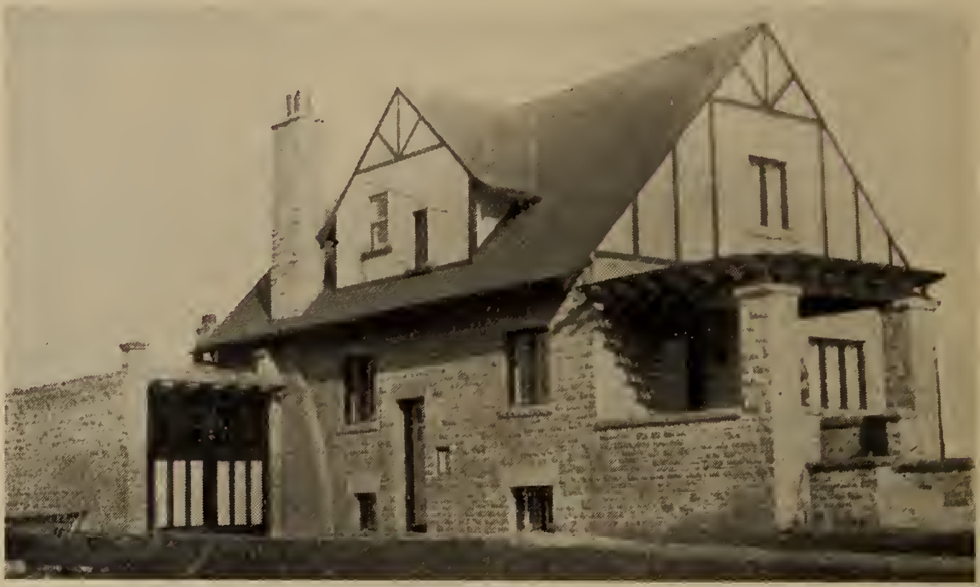
Hitting a new record for late fall building Winnipeg's construction programme for November was more than 100 per cent. ahead of the corresponding month last year and exceeds November records for some years back, according to permits taken out at the city building inspector's department. The statement for November shows $434,250 worth of permits issued as against $211,850 for November, 1922. The spread in construction was due chiefly to the $300,000 permit issued early in the month for the Winnipeg Electric Railway Co.'s coke ovens for the new gas plant.

There were 10 houses started during the month also and a satisfactory amount of smaller jobs. The increasing activity this autumn was not sufficient to overtake the lethargy of the spring and summer, however, and leaves the year's total $2,400,000 short of last year. To November 30, $4,446,150 worth of building was undertaken as against $6,838,400 to November 30, 1922.

Ammonia Compressors

The Canadian Ingersoll-Rand Co., 260 St. James St., Montreal, have issued bulletin K-314, descriptive of class ER-A and FR-A steam and belt driven ammonia compressors.

The Contract Record's
Weekly House Suggestion No. 92

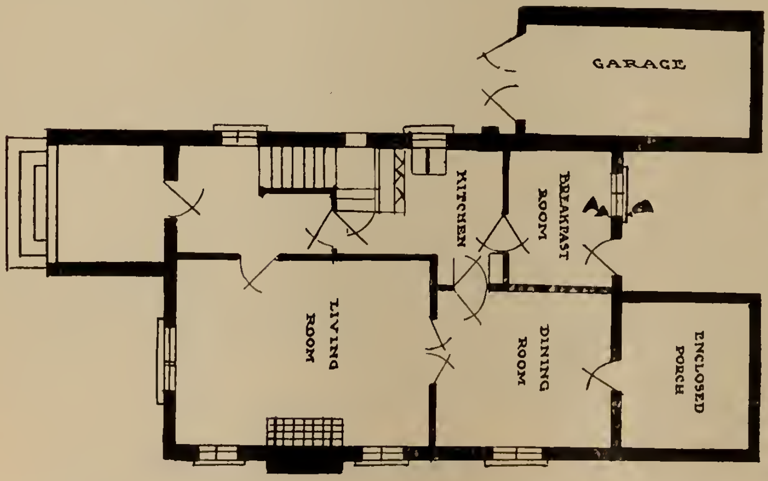


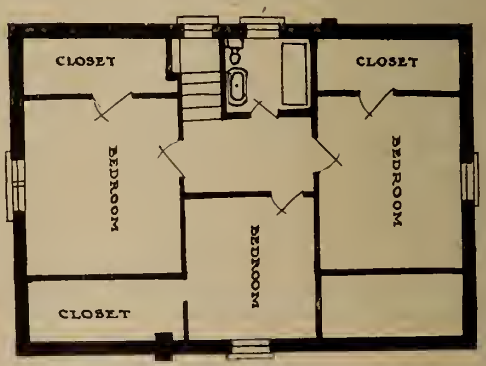
This handsome residence was erected recently on Montclair Avenue, Toronto, in the beautiful St. Clair residential district, by Mr. H. C. Willson, 1302 Ossington Avenue, Toronto. The general construction is carried out in hammered stone, with stucco and half timbering effect on the second floor. The exterior trim on windows, doors, main entrance porch, etc., is also carried out in stone. The roofing is of stained shingles. The house is especially adaptable to a narrow lot, yet the rooms are all of a good size and well located with relation to each other. There is an entrance on the side which gives convenient access to the basement and to the kitchen quarters. The living room and dining room are both large rooms. The former is equipped with a handsome cut stone mantel on the right and opens on the dining room through double French doors. The dining room opens on an enclosed porch at the rear. The interior trim throughout is in gumwood with the exception of the kitchen and breakfast room, which are in birch. The flooring throughout is of quarter cut oak.

Below the living room, in the basement, and occupying exactly the same space as this room, is a billiard room, equipped with a stone mantel and handsomely trimmed. The balance of the basement space is taken up with laundry, boiler room and coal room.

The upstairs plan provides three roomy bed chambers and combined bathroom and toilet, all conveniently arranged off the short hall. Trim is of gumwood, with the exception of the bathroom, which has tile floors and walls to a height of 4 ft. The flooring in the balance of the second floor is of quarter cut oak as downstairs.

Mr. J. E. Willson, 1302 Ossington Ave., designed this house.





Mainly Constructional

East and West—From Coast to Coast

The contracting firm of Larose & Lavalee, at Montreal, has been dissolved.

A recent report is to the effect that Toronto may have another large office building, at the corner of Adelaide & Victoria Streets. The report states that plans have been prepared by Mr. James J. O'Neill, owner of the property at the southwest corner of the above streets, for a 12-storey office structure to cost $800,000.

The Canada Steamship Lines, Limited, will present a bill at the next session of the Legislature asking for the confirmation and the ratification of a by-law passed by the corporation of Cap de la Madeleine, near Three Rivers, P. Q., regarding the establishment of shipbuilding yards in that municipality. The special act will also affect and confirm a deed agreed upon between the interested parties.

The municipalities of North York and Leaside, Ont., are considering the opening of Eglinton Avenue through to Don Mills Road, which will mean the construction of a new bridge over the Don River.

Without a dissenting vote, the Works Committee at Toronto a few days ago again approved the North Toronto sewerage scheme and recommended it to Council for adoption. A deputation appeared from North Toronto and urged that the work be completed as speedily as possible.

The campaign to raise $100,000 for the Memorial Hospital, at St. Thomas, Ont., was brought to a successful conclusion a few days ago. Although the exact amount collected is not known at this writing, it is believed that the objective has been realized with a good margin to spare.

The Catholic School Commission at Quebec recently decided, at one of their weekly meetings, to ask the provincial legislature for borrowing powers to obtain the sum of $500, 000, to finance proposed construction and to pay off the bulk of debts now on their hands.

Purchase of a half million dollar waterfront property, known as the Government dock, at Fort William, Ont., by James Playfair, Midland, Ont., was announced recently. The Government dock was held by the Canadian National Railway through absorption of the Grand Trunk Pacific and was the nucleus of a great terminal scheme planned by the G.T.P., which became unnecessary by the amalgamation. It consists of 600 feet of waterfront land in the heart of Fort William between Ogilvie's elevator, the C.P.R. subway and the railway tracks.

The first sod was turned in connection with the new $10,000,000 plant of the Dominion Alloy Steel Company at Sarnia a few days ago when about a dozen men began sinking holes on the site, six feet by 15 feet, to determine the nature of the soil on which the foundations of the new plant will be laid.

The A. B. Ormsby Co. Ltd., Toronto, have purchased the factory building at 138 to 166 Van Horne St., from the Sorenson Sheet Metal Company, for $50,000, and will transfer their present plant to the new premises. The building is a two-storey structure and the property has a frontage of 210 ft. on Van Horne St.

Application was made recently by Roberts Bros., builders, of Toronto, for a permit to erect four large apartment buildings on Spadina Road, Toronto, at a total cost in the neighborhood of $1,000,000. Plans have been prepared by Major N. G. Biggs, who designed the Ernscliffe Apartments and other large buildings of this type in the city. The request for permit is receiving the support of the local Trades and Labor Council, as the builders propose an immediate start on the work, if the permit is granted, which will mean a big step in the direction of relieving Toronto's unemployment problem this winter.

Mr. George Drew, architect for the Oshawa Realty Syndicate, 26 Prince St., Oshawa, Ont., is interested in receiving prices and catalogues on wholesale brick, lumber, tile, plaster, cement and general building supplies for their 1924 requirements.

The Royal Canadian Academy of Arts, Montreal, has offered a traveling scholarship of the value of $1,500 to Canadian architects, with the object of promoting the conception of architecture as the mother of arts, by encouraging an understanding by architects of mural decoration, sculpture, ornament and craftsmanship. The scholarship is restricted to Canadian citizens of at least six years' residence in Canada, and of not over thirty years of age.

British Empire Steel Corporation made good production records during November, especially in certain lines. The coke output for the month was approximately 36,000 tons. Tar production jumped to about 600,000 imperial gallons during the month, probably a record for the plant. Other figures are:— Sulphate of ammonia, 675 gross tons; sulphuric acid, 1,100 net tons; crude benzol, 170,000 imperial gallons; motor fuel, 105,000 imperial gallons. Iron production at the plant for the month was 29,500 tons. Other production figures at the plant are as follows:—Blooming mill, 24,000 gross tons; billet mill, 16,500 gross tons; rod mill, 8,000 gross tons. The rail mill closed down on Nov. 3rd. For the three days of November, 576 tons of billets were produced. Bar and rod mill working single shift produced 1,200 gross tons of rods and bars; sixteen-inch mill, 1,300 gross tons; wire, 3,200 net tons; nails, 900 net tons; Dominion Steel (special roofing nail) 35 net tons; galvanized zinc department, 1,100 net tons; staples, 100 net tons; clay brick, 100,000; silica brick, 145,000.

A recent report from England states that the huge building at Wembley, which will house the exhibits from the Dominion of Canada, in connection with the coming British Empire Exhibition, is about completed. The only work remaining to be done is a few finishing touches on the exterior and the interior trim and decoration. The Canadian pavilion is a large structure, of neo-Grecian design, built somewhat along the lines of the Louvre at Paris.

The Combustion Engineering Corporation, Ltd., Bank of Hamilton Bldg., Toronto, have been appointed Canadian representatives for the R. H. Beaumont Co., of Philadelphia, manufacturers of coal and ash handling equipment.

Personal

Mr. A. A. Carpenter succeeds G. H. V. Bulyea as chairman of the Public Utilities Commission, at Edmonton, Alta.

Mr. A. M. Kirkpatrick, resident government engineer for Goderich, Bayfield, Kincardine, Southampton and Tobermory harbors, went to London recently where he will act as assistant to Mr. H. B. R. Craig, district government engineer for Western Ontario, owing to the leave of absence granted W. J. Forbes-Mitchell, Mr. Craig's assistant, due to ill-health.

Mr. Rene Chenevert will succeed his late partner Mr. Emile Tanguay, as architect of the Catholic School Commission at Quebec.

Mr. E. Cowan, engineer with the Fegles Construction Company, Fort William, Ont., has been appointed mill engineer for the St. Lawrence Pulp & Paper Co., at Three Rivers, P. Q.

Mr. O. O. Lefebvre, who recently resigned as chief engineer of the Quebec Streams Commission, has been elected chairman of the Montreal Branch of the Engineering Institute of Canada.

CONSTRUCTIONAL ACTIVITY

Period of December 5 to December 11, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Bridgeburg, Ont.
The town council contemplates laying sewers in Gilmore St. Cost of work to be shared equally by Bridgeburg and Fort Erie, Ont.

Etobicoke Twp., Ont.
Tenders for supplying and laying approximately 1,400 ft. of 8 in. sewer, will be received by the township council till December 14. N. MacNicol, Islington, Ont, is the engineer. Plans and specifications at township offices.

Ford, Ont.
Tenders will be called on December 11, closing December 27, by the Essex Border Utilities Commission, 300 Ouellette Ave., for the erection of $250,000 filtration plant. Engineers in charge of this work are J. Clark Keith, Essex, Ont., and Gore, Nasmith & Storrie, Toronto. This plant will have a capacity of 20,000,000 gals. per day.

Ottawa, Ont.
The city council contemplate asphalt resurfacing pavement on Lisgar St., from Cartier to Emmitt St.

Port Colborne, Ont.
The ratepayers of Port Colborne, Ont., recently passed a By-law for building ot a waterworks plant costing $78,000. Consulting engineer is E. H. Darling, 72 James St. N., Hamilton, Ont.

Wallace Twp., Ont.
Tenders are being received till December 14 by the township council through the clerk, David Greer, Gowanstown, Ont, for the construction of municipal drain No. 1, tile and open work. Plans and specifications with clerk.

Wentworth Co., Ont.
The county council contemplate straightening and improving Governors Rd., from Creighton Rd. to Copetown. Engineer in charge of work is H. A. Lumsden, Court House, Hamilton, Ont.

CONTRACTS AWARDED

Etobicoke Twp., Ont.
The township council has awarded H. Phillips, Humber Bay, Ont., the contract for grading at 30 cents cu. yd. Engineer in charge is N. MacNicol, Islington, Ont.

Edmonton, Alta.
The contract for cast iron pipe has been awarded by the city of Edmonton to National Iron Corporation of Toronto, Ont.; de Levaul pipe f.o.b. cars Edmonton at $2.25 per foot, including tax, or a total of $5,625.

LaSalle, Que.
The $95,000 extension for water and sewage system is nearly completed. Sewage disposal equipment is being supplied by Francis Hankin & Co., Ltd.; chlorinating plant by E. Lauric & Co. Both of Montreal. Engineer in charge is J. A. Roy, Room 209, 71a St. James St., Montreal.

New Westminster, B. C.
The contract for bank protection has been awarded to Vancouver Pile Driving & Contracting Co., Vancouver, B. C., at $37,964.

Quebec Province.
Provincial Government Department of Roads has awarded the following contracts for gravelling roads; Calumet Village, Co. Argenteuil, on Montreal-Ottawa via Hull Highway—H. Marchessault & Co, 2507 Lafontaine St., Montreal at $3,746.20; Yamachiche Village, Co. St. Maurice, on Quebec-Montreal highway—B. J. Trepanier, 333 Notre Dame St., Three Rivers at $5,301.53; Tache Twp., Co. Chicoutimi; on St. Bruno-Roberval St. Bruno highway—Chs. Potvin & Adelard Renaud, Delisle, Co. Lac St. Jean at $23,631.90; St. Joseph Village, Co. St.Hyacinthe; on St. Hyacinthe-Melbourne highway—Tetrault Construction Ltd, St. Germain de Grantham, Co. Drummond at $2,793.26; Parish of St. Hyacinthe Le Confesseur, Co. St. Yyacinthe, on St. Hyacinthe-Melbourne highway—Tetrault Construction Ltd., St. Germain de Grantham at $19,144 44; Hampden Twp., Co. Compton—Samuel G Scott & Robert E. Scott, Scotstown, Co. Compton at $4,461.76. Work to start in spring.

Welland, Ont.
The city council has awarded the contract for sewers on Cozy St., to C. J. White, 456 Main E., at $987.55.

Winnipeg, Man.
The city of Winnipeg has awarded the following contracts for cast iron water pipe: National Iron Corporation Ltd., Toronto, for 500 ft. 4 in. pipe at 65 cents ft.; 3,000 ft. 6 in. at $1.00 ft.; 1,000 ft. 10 in. at $1.90 per ft. Empire Waterworks Supply Co. of Canada, Ltd., for 1,500 ft. of 14 in. pipe at $3,23 per ft.

York Twp., Ont.
The following contracts for watermains have been awarded by the township council; Eglinton and Glebholme Aves.—F. C. Shipps, 1609 Queen W., at $1,250; Eaton and Don Mills Rd., township engineer, F. Goedike, 40 Jarvis St., Toronto, at $1,000.

Railroads, Bridges and Wharves

Chatham, Ont.
Plans are being prepared for the erection of a steel bridge over McGregor's Creek, near here, for Pere Marquette Railway, St. Thomas, Ont.

Lingan Bay, C. B.
Work has just started for the erection of $30,000 steel bridge here. J. E. Belliveau, Parliament Bldgs., Halifax, is the assistant engineer in charge.

Pembroke, Ont.
A By-law was recently passed by the ratepayers, for the erection of a bridge at St. Mary St, over Muskrat River, to cost $75,000. Bridge will consist of three 90 ft. steel spans.

Rimouski, Que.
Tenders are being received till December 27 by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for the construction of wharf here to cost $20,000. Plans and specifications at department; offices of district engineers, Lower St. Lawrence Power Bldg., Rimouski. A 10% accepted cheque required.

CONTRACTS AWARDED

Quebec Province.
Dept. of Public Roads has awarded the following contracts for bridges to be built in this province; contract awarded for 3 bridges in Chateau Richer Parish to T. F. Rousseau Ltd., Limoilou, Quebec; contract awarded for 1 bridge in Petit Lac Magog to Kennedy Construction Co. Ltd., 137 McGill St., Montreal $5,300. Work to start shortly at Petit Lac Magog.

Quebec Ouest, Que.
The town council has awarded the contract for iron bridge to be built on Marie de L'Incarnation St., to T. E. Rousseau Ltee, Limoilou, Que.; also for erection of iron bridge "Scott." Ivan Vallee, Parliament Bldgs., Quebec, is the engineer.

Mouton County, Que.
The general contract for 3 reinforced concrete bridges to be erected in parishes of Chateau, Richer and L'Ange Gardien, on Quebec-St. Simeon highway, has been awarded to T. E. Rousseau, Ltd., Limoilou, Que., at $10,434.30.

Prairie Siding, Ont.
General contract for bridge to be built over River Thames, has been awarded by the Kent County to Can. Des Moines Steel Co., Chatham, Ont., at $78,340. Engineer is W. G. McGeorge, C E., Chatham, Ont. General contractor for abutments, Wm. Bermingham & Son, Kingston.

Whitby, Ont.
W. H. Harvey, Deseronto, Ont., has been awarded the general contract for rebuilding trestles, Whitby to Bomanville, Ont, at $20,000.

Public Buildings, Churches and Schools

Belleville, Ont.
Work is to start at once for church to be built on Coleman St. for Standard

Church of America. Work day labor by congregation.

Charlottetown, P. E. I.
Prince Edward Island Hospital contemplate alterations and improvements to the hospital, at a cost of $70,000.

Halifax, Ont.
The erection of a $70,000 fisheries experimental station here is contemplated by Dept. of Marine & Fisheries. This will consist of a model fish drying plant, model smokehouse, a lecture building including chemical laboratory.

Harvey, Que.
The school board contemplate the erection of a new school here.

London, Ont.
Revised tenders are being received from the four lowest tenderers, closing with architect December 15, in connection with $500,000 seminary to be built here for St. Peters Seminary, Dufferin Ave. Architects, Pennington & Boyde, Bartlett Bldg., Windsor, Ont.

The ratepayers of London, Ont., recently defeated a By-law for the erection of a $600,000 city hall here.

Montreal, Que.
Tenders will be called December 10, closing December 15, by the architect, E. A. Doucet, 195 Ste Catherine East, for public hall and office building to be built corner Bonsecours and Champ de Mars, owned by Debardeurs Syndiques di Port de Montreal. Plans and specifications with architect.

Viau & Venne, St. James St., are preparing plans of college to be built on Decelles St. for St. Marys College, 232 Bleury St.

Scarboro Twp., Ont.
The township council propose building a fire hall on Danforth Road near provincial highway.

St. Thomas, Ont.
A By-law for the erection of $40,000 public market, corner Talbot and Manitoba Sts., has been defeated by the ratepayers.

St. Catharines, Ont.
A By-law for the erection of $30,000 stadium here, was recently defeated by the ratepayers.

Toronto, Ont.
Tenders in connection with completion of assembly hall for Humberside Collegiate, have been referred back to property committee, which meets on December 13.

Humewood House, west side Humewood Drive, contemplate $50,000 addition to children's home.

E. J. Lennox, 364 Bay St., is preparing plans for alterations and addition to Western Hospital buildings.

The Board of Education contemplate an addition to Harbord Collegiate.

CONTRACTS AWARDED

Alexandria, Ont.
The walls are going up for $32,000 public building being built here. Following sub-trades have been let; plumbing and heating—Erskine Smith & Co.; tile and marble—A. K. Mills; roofing and sheet metal—McFarlane-Douglas Co.; stonework—Oscar Noel, Hull P. Q.; plastering—Murphy & Morrow; steel—Dominion Bridge Co., Ltd.; electric—Marchand Electric Co.; painting—W. J. Carson, Laurier Ave. W.

Gore Bay, Ont.
General contract for addition to court house here has been awarded to Edward Charters, 139 Spring St., Sault Ste. Marie, Ont.

Montreal, Que.
Alphonse Gratton, 511 Ste. Catherine W. has been awarded the general contract for altering and adjoining old building on Sherbrooke St. E., into Hospital at a cost of $200,000, owned by Notre Dame Hospital, 551 Notre Dame E. Architects are A. H. Lapierre, 30 St. James St., Montreal, and Stevens & Lee, 62 Charles St. E., Toronto, Ont.

Sackville, N. S.
The following sub-contracts have been let on $29,800 post office being built here; steel work—Eastern Canada Steel & Iron Works, Ltd., Quebec, Que.; masonry—Nova Scotia Clay Works, Amherst; millwork—Rhodes Curry, Ltd., Amherst; plumbing and heating—Byrne & McGeouch, 128 Germain St., St. John. General contractor is E. F. Powers Construction Co., St. John.

Sydney, N. S.
Campbell & Desmond, Charlotte St., have the contract for electrical work on $45,000 community building being built for Presbyterian & Methodist Missions. General contractors are Chappells Ltd., 62 Brookland St. Painting and glazing by general contractor.

St. Lambert, Que.
H. Gravel, 129 St. Denis St., has been awarded the general contract for $10,000 public building to be built here. Engineer in charge is J. Kellett.

St. Perpetue, Que.
General contract for $90,000 church to be built here for R. C. Parish, has been awarded to Paquette & Roberge, Ste. Marie de Beauce, Que.; structural Steel—Phoenix Bridge & Iron Works, Montreal; painting—M. Lachance, Levis, Que.; sculpture—M. Charbonneau, Que, Que. Architect, Louis Caron, Nicolet, Que.

Stoney Point, Ont.
Louis St. Denis, Ford, Ont., has the general contract for school to be built here for Separate School Board. Heating, painting, plastering, plumbing, and electric to be let. Architect, G. J. P. Jacques, Windsor, Ont.

Toronto, Ont.
Taylor Bros., 25½ Norwood Rd., have the electrical contract on $100,000 addition to Danforth Ave. Methodist church. Architects, G. M. Miller & Co., 93 Yonge St.

The Board of Education has awarded Art Wire & Iron Co., the following contracts for ornamental iron work-Silverthorne school, $4,750, and Riverdale Collegiate $2,422.

Taber Ford Construction Co., Ltd., 533 St. Clair Ave. W., have the general contract for addition to Sunday school of Boon Ave. Baptist Church Congregation, and want prices on excavating, electric, painting and steel. Masonry roofing and tiling to be let.

W. E. Dillon Ltd., have the contract for roofing and sheet metal work on college buildings being built on Hoskin Ave. for Trinity College. Architects, Darling & Pearson.

Timmins, Ont.
The walls are going up for $120,000 high school being built here. Roofing contract has been let to A. Brazeau, Timmins. General contractors are Schultz Bros. & Co., Ltd., Brantford; architects, Pennington & Boyde, Windsor; associate architect, J. W. Leighton, Windsor.

Vancouver, B. C.
Pacific Construction Co., Ltd., Vancouver, have been awarded the general contract for $400,000 grain jetty owned by Board of Harbor Commissioners. Architect, Major W. G. Swan, 712 Pender St., W., Vancouver.

Business Buildings and Industrial Plants

Arnprior, Ont.
An addition to hotel on John St., owned by J. R. Byrne, is contemplated. Cost of work is estimated at $25,000. Work to go ahead in spring.

Cornwall, Ont.
C. R. Tetley, 314 Beaver Hall Hill, Montreal, Que., is preparing plans of $2,000,000 silk factory to be built here for Courtaulds Limited, Coventry, England. Tenders for this work will be called by the architect in the spring.

Capreol, Ont.
Pine Products of Canada Ltd., of Toronto, Ont., contemplate building a factory here for the manufacture of pine tar, turpentine, etc. Work will go ahead in the spring.

Cooksville, Ont.
Shale Brick Co. of Canada, Ltd., Toronto, contemplate an extension to their machine shop.

Hull, Que.
Canadian Mirror & Novelty Mfg. Co., contemplate an addition to their factory here.

Fraser Jct., B. C.
McLean Shingle Co., Ltd., New Westminster, B. C., are having plans prepared of $60,000 shingle mill to be built at Fraser and Pitt Rivers Junction.

L'Islet, Que.
Work is now under way for $15,000 factory being built here for Eugene Gagnon. Work day labor under supervision of owner.

Lauzon, Que.
The foundations are in for $10,000 club hall for Nationale de Ouvrieres de la Rive Sud. Work by day labor.

London, Ont.
Plans are being prepared for garage repair shop and service station on York St. W. J. Chisholm, 478 Richmond St., is the owner.

Montreal, Que.
D. J. Crighton, 851 Oxenden Ave., is preparing plans of moving picture theatre to be built on Park Ave. near Bernard, owned by United Amusement Co., 424 St. Catherine St. W.

Mission, B. C.
J. R. Mathers, Mission, B. C. is owner and builder of $12,000 planing mill to be built here.

Ottawa, Ont.
Foundations are in for stores and garage corner Bank and Argyle Sts. Ten-

ders are being received by the owner, Barret Bros., 260 Catherine St., or general contractor, T. C. James, 130 Flora St., for painting, plastering, electric, plumbing and heating.

Province of Quebec.
F. W. Clarke, 17 St. James St., Quebec City, contemplates building a saw mill to cost $1,000,000. Forestry Concession on Manicougan River has been purchased, and mill will produce 100 tons of plup and 100 tons of paper a day. This work will probably go ahead in the spring.

Port Burwell, Ont.
Walter Underhill contemplates building a store on Main St. No materials purchased.

Point Edward, Ont.
Hunt Bros., Ltd., London, Ont., contemplate the erection of a grain elevator here, with 1,000,000 bushel capacity. Cost not yet decided. By-law to be voted on January 1st.

Prince George, B. C.
Work is to start at once on $25,000 freight shed for Canadian National Railways. All tenders on this work have been rejected and work will be done by day labor. Electric and plumbing trades not yet let.

St. Catharines, Ont.
Tenders are being received till December 17, by the architects, Nicholson & MacBeth, 46 Queen St., on store, offices and lodge costing $50,000 to be built here, owned by Union Lodge, I.O.O.F. No. 16. Plans and specifications with architects, and MacLean Building reports, Ltd., 345 Adelaide St. W., Toronto.

Toronto, Ont.
A syndicate has been formed for the erection of a 12 storey office building to cost $800,000, south west corner Adelaide and Victoria Sts. Wm. F. Sparling & Co., 54 University Ave., are preparing the plans. No definite date has been decided upon as to when this work will start.

The walls are going up for $45,000 factory north west corner Jarvis and Lombard Sts., owned by Geo Sheppard, 42 Colborne St. Architect and engineer, Ashley Woodburn, 89 Willow Ave. Plumbing, heating, electric and elevator to be let.

Welland, Ont.
The erection of a $30,000 garage on East Main St., is contemplated by Gram Bros., Division St. Architect, N. A. Kearns, Temple Bldg.

Winnipeg, Man.
Work has commenced on $40,000 woodworking factory on Market St., E., for G. W. Murray Co., Ltd., who are interested in prices on the following subtrades; roofing, sheet metal, electric, plumbing, heating, painting and glazing, miscellaneous iron, and elevator.

CONTRACTS AWARDED

Edmonton, Alta.
Crown Paving Co., Edmonton, have been awarded the contract for excavation work in connection with $18,200 grain elevator, at 65 cents per cubic yard.

Deschenes, Que.
Alex. I. Garvock, Ottawa, Ont., has the general contract rebuilding dairy buildings owned by John Lumsden.

Ford, Ont.
Excavation work is in progress for $35,000 branch bank of Provincial Bank of Canada, Montreal. Following subtrades have been let; steel—Canadian Bridge Co.; steel sash—Trussed Concrete Steel Co ; sheet metal, plumbing and heating—Alex. White, Windsor, Ont. General contractors are Windsor Construction Co., Ltd., Walkerville, Ont. Architect, G. J. P. Jacques, Windsor, Ont.

Kitchener, Ont.
Reitdel Bros., Waterloo, Ont., have the general contract for $45,000 addition to warehouse on King W., owned by M. B. Shantz. Architects, Schmaltz & Jones, 15 Queen St. S.

Montreal, Que.
Excavation work is being done for theatre, stores, bowling alleys and flats, costing $200,000 on Bernard Ave. Leger & Lamoreux, St. Denis building, 294 St. Catherine E. are the general contractors, and are in the market for all materials. Architect, R. Gariepy, 15 St. James St.

Pouring concrete 6th floor is in progress on $1,100,000 office building being built on Bleury Street. Plastering contract has been let to Frs. Beaudoin & Fils. 62 Christophe Colomb. Architects, McVicar & Heriot, 628 Union Ave. General contractor is C. Archambault, 610 Lafontaine Park.

Campbell Gilday Co, Ltd., have the contract for roofing in connection with repairs to garage costing $8,000, at 195 Mountain St., owned by Bell Telephone Co. Cook & Leith are the general contractors.

Ottawa, Ont.
The walls are going up for $8,000 addition to store on Rideau St., owned by A. Shaffer, 147Rideau St. Following subtrades have been let; electric—Marchand Electric Co.; plastering—M. Normand, St. Patrick St. Painting by day labor. General contractors are Ferguson & Lambert, 643 King Edward Ave.

Port Colborne, Ont.
Excavation work is being done for $9,000 garage on Fraser St., owned by Harry Sidey. Geo Habel has the contract for masonry. No sub-contracts let.

Quebec, Que.
The walls are going up for $300,000 hotel "St. Roch," at 234 St. Joseph St. Iron fire escapes being supplied by P. Marchand, 265 St. Valier St., at $2,000. Owner of building is J. Oscar Gilbert 99½ Lockwood St.

Renfrew, Ont.
Foundations are going in for factory being built here for Seaman-Kent Co., Ltd., of Toronto. General contractors and engineers are Wells & Grey, Ltd., Toronto.

St. Hyacinthe, Que.
Daniel & St. Jean, St. Hyacinthe, Que., have the roofing contract for $40,000 addition to factory of Penman's Ltd. Balance of work by day labor.

Stratford, Ont.
Partridge Bros., Ontario Street, have the plumbing and heating contract in connection with addition and remodelling "Majestic Theatre" to cost $40,000, owned by A. Brandenberger, Wellington St.

Truro, N. S.
Work is in progress for repairs to stores and offices on Inglis street, owned by Estate of Dr. McKay. General contract has been awarded to W. K. Murray.

Toronto, Ont.
Lioni & Co., 1466 Dufferin St., have the contract for excavation work for $125,000 light manufacturing building being built at 207-215 Richmond West for Gelber Bros., Ltd. Architect, Benj. Brown, 287 Spadina. General contractors, Dowling & Williams, 167 Yonge St.

Vancouver, B. C.
Archibald Rodger, 2998 Third Ave., W., has the general contract for alterations to stores, $10,000, corner Robson and Thurlow, owned by Dr. David H. Wilson, 1966 Haro St. Electric, plumbing, plastering, painting and glazing not yet let.

North West Dredging Co. have the general contract for $150,000 grain jetty to be built on east side government dock.

Waterloo, Ont.
Ellert Bros, Park Ave., are the general contractors for $9,500 warehouse being built on King St. for O'Donnell & Henderson. Electric, heating and painting to be let.

Welland, Ont.
Foundations are in for pipe storage building for Page-Hersey Tubes, Ltd., Toronto. Foundation work is being done by Diffin Construction Co., Welland, Ont. Structural steel—Standard Steel Construction Co., Welland.

Windsor, Ont.
Foundations are in for $200,000 ice plant, owned by Empire State Ice Co., of Chicago and Windsor. Following subtrades have been let; general contract—Blome Sinek Co., Chicago; steel—Canadian Bridge Co., Ltd.; plumbing—Windsor Plumbing & Heating Co.

Residences

Cooksville, Ont.
Foundations are in for $6,000 residence being built on Melville Park. W. F. B. Rubidge, Port Credit, Ont., is the owner and builder.

Wm. Morris, Erindale, Ont., contemplates building 3 residences on Agnes St. No material purchased.

Dunnville, Ont.
The walls are going up for 3 residences, $3,500 each, west side of John St. Aden Foster is the owner.

Hamilton, Ont.
W. Ellis, Normanhurst Ave., is owner and general contractor of 5 residences, $7,500, on Strathearn Ave., and will let sub-trades and buy materials.

A. Bolingbroke, 95 Ottawa St. S., is the owner and general contractor of 3 residences, $7,500, being built on Cluny Ave., and will let sub-trades.

Work has just started for 2 residences, $8,000, on Westdale Ave. Blain Bros., 127 Emerald St. N., are the owners and general contractors and will let sub-trades and buy materials.

Islington, Ont.
J. Hunt Stanford & Son, 67 Yonge Arcade, Toronto, Ont., are preparing

plans of $10,000 residence to be built here for S. B. Pretty, 16 Delaware Ave.

Kitchener, Ont.

Work is to start shortly on $5,000 residence being built on Louisa St., by Ellert Bros., Waterloo, Ont.

Montreal, Que.

Framework is going up for 2 residences, $10,000, on 4th Ave. between Masson and Dandurand. N. L. Leger & Co., 5523 Fourth Ave. is owner and builder. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

J. D. C. Martin, 266 Ontario E., is owner and builder of $8,000 residence on Old Orchard between Monkland and Cote St. Luc. Sub-trades to be let.

J. Hoolahan, 604 Old Orchard, is owner and builder of 4 residences, $25,000, on Old Orchard, near Monkland. Sub-trades to be let.

A. Leclaire, 120 Leclaire, is owner and builder of 5 residences, $60,000, on Ville Marie, between Ste. Catherine and Notre Dame. Sub-trades to be let.

Owen Roberts, 6967 Sherbrooke W., is owner and builder of 6 residences, $36,000, on Hampton Ave. and Monkland, Notre Dame de Grace. Masonry, marble and tiling, millwork, roofing, electric, plumbing, heating, plastering and painting to be let. Carpentry by day labor.

F. Pepin, 1267 Des Erables, is owner and builder of $8,000 residence on St. Denis, between Isabeau and Castelneau. Sub-trades to be let.

Framework is going up for 2 residences, $12,000, at 3563 Berri St. L. Champagne, 3567 Berri St., is the owner and builder. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 3 residences, $31,000, on Girouard, between Cote St. Luc and Monkland. O. Brunet, 425 St. Antoine, is the owner and builder. Sub-trades to be let.

E. Parent, 347 Sixth Ave., Ros., is owner and builder of 2 residences, $8,000, on Letellier, near Blvd. Gouin. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $20,000, on Christophe Colomb, between Bellechasse and Beaubien. W. Deslauriers, 651 De Gaspe, is the owner and builder. Architect, Chas. Bernier, 70 St. James St. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

J. Davis, 3 Burnside Place, is preparing plans of 10 storey apartment house to be built north east corner Burnside Place and Mansfield St., owned by the Senneville Apartment, Ltd., care Campeau & Denis, 68 St. Denis St.

Framework is going up for 2 residences, $12,000, on Des Erables, near Masson. Owner and builder is J. B. Seguin, 308 Gilford. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are in for $10,000 residence on Lafontaine, between Bennett and Aird. E. Simard, 444 Orleans, is the owner and builder. Brickwork, millwork, roofing, electric, plumbing, plastering, painting and glazing to be let.

O. Vincent, 141 Denormanville, is the owner and builder of 3 residences, $18,000 on St. Denis, between Faillon and Villeray. Sub-trades to be let.

E. P. Dusseault, 850 Davaar, is owner and builder of $10,000 cottage on Wilder Ave., near Van Horne. Sub-trades to be let.

Outremont, Que.

Work is to start shortly for $50,000 apartment house on Joyce, near Outremont Ave. A. Julien, 714 Bloomfield St., is the owner. Architects, Perrault & Gadbois, 2100 Park Ave.

Ottawa, Ont.

Walls are going up for $8,000 residence on Grove Ave. Owner and general contractor — Brookes & Wilson, 69 Union St., who are receiving tenders on electric, heating, plastering and plumbing. No closing date set. Balance of trades by day labor.

Point Grey, B. C.

W.M. Roberts, 1949 36th Ave. W., Point Grey, is owned and builder of $7,500 residence on 19th Ave. W. No materials purchased. No sub-trades let.

Stratford, Ont.

H. F. Holman, Ontario St., is preparing plans of $7,500 residence to be built on William St., for J. M. Riddell, 136 Hibernia St.

Toronto, Ont.

Excavation work is being done for $9,000 residence and garage at 42 Glenwood Ave. Owner and builder is Frank Taylor, 182 Willard Ave. Tenders are being received for plumbing, heating, painting, plastering and electric.

Foundations are in for $12,000 duplex residence on Northcliffe Blvd. Harry J. Long, 76 Glendonwynne Ave., is the owner and builder. Tenders are being received on painting and plastering.

Excavation work is being done for $12,000 duplex residence on Rose Park Drive and Heath St., for R. D. Davidson, 184 Arlington Ave. Architect, D. H. Burnham, 260 Lauder Ave.

Tenders are being received by Thos. Taylor, 71 Vermont Ave., on electric, plumbing, painting, plastering, heating and decorating in connection with $9,500 residence and garage being built east side Humewood Ave., near High.

C. Thorne, 545 Crawford St., is owner and builder of $7,500 residence west side Wychwood Ave., near St. Clair West. Tenders are being received on hot water heating, plastering, electric and plumbing. Painting by owner, day labor.

Walls are partly up for $7,500 bungalow, east side Durie Ave., near Ardagh, for A. Tucker, 227 Fairview. Tenders are being received on heating, electric and plumbing.

Tenders are being received by the owner, A. Clark & Son, 224 Augusta Ave., on painting, electric, plastering and tiling (2 bathrooms and verandah) for 2 residences, $12,000 each, at 31-33 Austin Terrace.

McDonald & Miller, 33 Woodycrest, are the owners and builders of 1 pair residences, $7,500, south side Milverton Blvd. near Woodington Ave, and will let painting, plastering, heating, plumbing and electric. Masonry day labor.

Excavating work is to start at once for 9 residences, $50,000, south west carner Crawford St. and Dewson. H. ES McRobb, 55 Condor Ave. is owner and builders. Tenders being received on all other trades. No materials purchased.

Mantle & Ellis, 214 Glebemont Ave., contemplate building 2 residences, $3,500 each, south side Frater near Woodmount Ave.

Excavation work is now being done for $126,000 apartment house south west corner Homewood Ave. and Wellesley Crescent. D. Lavine, 308 St. Clair West, is the owner. Architects, Kaplan & Sprachman, 298 Dundas W. Owner and architects are receiving prices on structural steel, stone (artificial and natural) and lumber.

Work is to start shortly on 4 pair residences, $36,000, east side Elmer, near Rhyl Ave. Chatterton Bros., 100 Elmer Ave., are the owners and builders. Masonry day labor. Plumbing, heating, plastering and painting to be let.

Tenders are being received on smaller trades in connection with $15,000 residence and garage to be built on south side Montclair Ave., near Westmount Drive. A. P. Herbert, 297 Havelock St., is the owner. Architect, D. H. Burnham, 260 Lauder Ave.

John Gillespie, 174 Soudan Ave., is owner and builder of $9,000 residence north side St. Germain Ave., near Jedburg Rd., and will let heating, electric, plumbing, plastering and painting trades. Masonry by day labor.

E. Cox, 411 Symington Ave., is owner and builder of 2 residences, $5,500 each, north side Hyde Ave., near Bicknell. Plumbing, heating, electric, plastering and painting to be let.

Work is to start shortly for 6 or 7 residences, $4,000 each, on north east corner Poulton and Woodmount Ave. Owner and builder is J. McKennan, 14 Harris Ave. Tenders are being received on plumbing, heating, electric plastering and painting.

The walls are going up for $9,500 residence and garage, east side Humewood Ave., near High. Owner and builder is Thos. Taylor, 71 Vermont Ave. Tenders are being received on plastering, electric, plumbing and heating. Painting by owner.

H. R. Watson, 36 Toronto St., is preparing plans of alterations to residence for duplex, costing $10,000, on Prince Arthur Ave. Tenders for this work will shortly be called.

Walls are going up for $7,500 residence and garage, north side Harcroft Rd., near Olympus. B. T. Huston, 208 Western Ave., is the owner and builder Tenders are being received on plastering, electric, plumbing, heating and painting. Carpentry and masonry by day labor.

The walls are now up for $7,500 duplex residence and garage on Hopedale Ave. Owner is G. Howe, 175 Cosburn Ave., who is receiving tenders on electric, heating and plumbing.

Verdun, Que.

Daoust & Rolland, 103 Second Ave. are owners and builders of $7,000 residence on 3rd Ave. Masonry, millwork,

(Continued on page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

DEPARTMENT OF RAILWAYS AND CANALS

WELLAND SHIP CANAL

Section 8

NOTICE TO CONTRACTORS

Contractors are hereby notified that the time for receiving tenders in connection with construction of Section 8, Welland Ship Canal, has been

extended to January 15, 1924,

By Order,
J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, December 5th, 1923. 50

ESSEX BORDER UTILITIES COMMISSION

Tenders for Water Purification Plant

Sealed tenders addressed to the Secretary of the Commission will be received by the Essex Border Utilities Commission, Heintzman Building, Windsor, Ontario, up to 4 p.m. on

Thursday, December 27, 1923,

for the following contracts connected with the construction of a water purification plant in Ford City, Ontario.

- (a) Construction of reinforced concrete Filters, coagulating basins, pure water reservoir, office building, etc.
- (b) Supplying 42" diameter steel pipe.
- (c) Supplying cast iron pipe and specials.
- (d) Supplying valves and sluice gates.
- (e) Supplying Rate Controllers and operating tables.

Plans and specifications can be obtained and further information secured from J. Clark Keith, Chief Engineer of the Commission, Windsor, Ontario, or from Gore, Nasmith & Storrie, Consulting Engineers, 625 Confederation Life Bldg., Toronto, Ontario.

A cheque for $10.00 must be submitted before plans and specifications can be obtained for the construction contract (a) which will be returned on tenders being submitted.

A marked deposit cheque for 5% of the tender sum must accompany all tenders.

These tenders will be opened at a public meeting to be held in the office of the Commission at 4 p.m., Thursday, December 27th, 1923.

The Commission reserves the right to accept any or reject all tenders.

R. B. BRAID,
50-51 Secretary.

LOCOMOTIVES, NEW

30-in. and 36-in. gauge, 23 tons, Tractive Power, 9000 lbs. coal, oil or wood burners.
Very attractive prices.
R. POLIAKOFF,
709 Sixth Ave., New York, N.Y.
47 and 50

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

DEPARTMENT OF RAILWAYS AND CANALS, CANADA. WELLAND SHIP CANAL

Section 8

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tenders for Section 8, Welland Ship Canal," will be received at this office until 12 o'clock noon, on

Thursday, December, 27th, 1923,

Plans, specifications and form of contract to be entered ino can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in Charge, Welland Ship Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of fifty dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for the sum of $550,000 made payable to the order of the Minister of Railways and Canals, or War Loan Bonds of the Dominion of Canada to the same amount or War Loan Bonds and cheques if required to make up the difference, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque or bonds of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order,
J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, November 29th, 1923. 49-50

DEPARTMENT OF TRADE AND COMMERCE, CANADA

Elevator Pile Foundation, Edmonton, Alberta

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and marked "Tender for Pile Foundation, Edmonton Elevator," will be received at Ottawa until twelve o'clock noon, on

Friday, December 28, 1923,

Plans, specifications, and forms of contract to be entered into can be seen at the office of C. D. Howe & Company, Consulting Engineers, at Port Arthur, Ontario, and at Edmonton, Alberta. Copy of plans and specifications may be obtained from C. D. Howe & Co., on application by bona fide tenderers.

An accepted bank cheque on a chartered bank of Canada for the sum of $3,000 made payable to the Minister of Trade and Commerce must accompany each tender which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily acceptd.

By order,
F. C. T. O'HARA,
Deputy Minister.

Department of Trade and Commerce,
Ottawa, December 10, 1923. 50

Formulate Principles to Underlie Building Trade Apprenticeships

General principles which it was agreed should underlie apprenticeship training in the building trades were formulated at a conference in Washington Nov. 15 between the Federal Board for Vocational Education and representatives of employers and employees and material supply manufacturers.

Eight general principles were laid down. They are:

1—That a local representative committee composed of all interests in the industry is essential to determine the needs and supervise the training.

2—That part time or evening schools should be provided to supplement job training.

3—That all-around training is more desirable than specialized training.

4—That the national associations should set up fundamental training standards for apprentice training and make the information thereon available for instructional purposes.

5—That co-operation with the public schools is essential to the promotion of apprentice education.

6—That incentives should be set up to induce boys to enter apprenticeship.

7—That pre-employment training for employed apprentices or boys under contract is recommended.

8—That emphasis should be placed on dull-season training to follow up the initial training given in the pre-employment period.

A number of those attending the conference, which was called for discussion of the apprenticeship problem rather than for immediate definite action, recited plans which have been followed in various trades at specific localities to induce more young men to enter apprenticeship, or which have been devised to be put into operation soon.

Residences

(Continued from page 53)

roofing, electric, plumbing, plastering and painting to be let.

Foundations are in for $7,000 residence on LaSalle Rd. Jerome Masse, 170 First Ave. is owner and builder. Roofing, electric, plumbing and plastering to be let. Masonry, painting and glazing by day labor.

J. C. Monpetit, 630 Evelyn St. is owner and builder of $7,000 residence on Verdun St. Masonry, millwork, roofing, electric, plumbing, plastering and painting to be let. No materials purchased.

Windsor, Ont.

O. Knapp, 103 Baby St., Sandwich, Ont., is the owner and general contractor of $8,500 duplex residence being built on Goyeau St. No material purchased. Painting, electric, plumbing and plastering to be let.

CONTRACTS AWARDED

Galt, Ont.

The following sub-trades have been let on $7,000 residence corner Brant Rd. and Salisbury Ave., for Dr. J. H. Radford, 26 Colborne St.; carpentry—P. Nichol, 28 Blair Rd.; electric — W. H. Hernsey, 55 Dickson St.; painting—A. G. Bruce, 18 Queens Sq. Other trades not let. H. Thomas & Son, 45 Dickson St., are the general contractors.

Kitchener, Ont.

C. Dankwart, Mill St., has the contract for masonry work on $6,000 residence being built on Lancaster St. Chas. Williams, 213 Mill St., is the owner and builder.

The walls are going up for $4,500 residence on Mill St. C. Dankwart, Mill St., is the owner and general contractor. Roofing, Ed. Schnarr, 41 Elgin St. Painting and glazing by day labor.

London, Ont.

Webster Construction Co. have the general contract for $7,000 residence to be built on Bridgeport St., for F. G. Hill, care general contractors.

Mount Royal, Que.

H. R. Cassidy, 255 Regent St., has the contract for electrical work on 4 residences, $32,000, near Montreal, for Model City Housing Co., Montreal. General contractors are Bremner Norris & Co., Ltd.

The following sub-trades have been let on 4 residences, $30,000, being built near Montreal, for Model City Housing Co, Montreal; electric—Marcou & Frere, 450 Roy E.; plastering—J. Villeneuve, 3534 St. Denis St.; painting and glazing by general contractor, Bruno St. Pierre, 3448 Henri Julien Ave., Montreal.

Montreal, Ont.

N. Lapierre, 618 Fabre St., has the plastering contract on 2 residences, $15,000, being built on St. Valier, between Belanger and Isabeau, for E. Leonard, 3035 Christophe Colomb. J. Labelle, 3528 Christophe Colomb is the general contractor.

W. Rutherford & Sons Co., Ltd., have the contract for millwork, and O. Bergeron, 168 Beaudry St., the ornamental iron contract, for 28 residences, $150,000, being built on Redpath, between Sherbrooke and pine ave. Senneville Development Co., Ltd., are the owners and builders.

The following sub-trades have been let on $20,000 residence being built on Pine Ave., between Cote des Neiges and Simpson, for G. I. Drummond, 314 Notre Dame West; marble and tiling—G. R. Locker, 143 Mansfield St.; roofing — Richardson Simard & Co.; painting and glazing—A. Craig Ltd.; plastering by general contractor, J. MacGregor, Lrd., 44 Closse St.

The following sub-trades have been let on 4 residences, $35,000, on Patricia, between Terrebonne and Somerled; millwork — Riopel & Frere; roofing — D. Nicholson & Co.; electric — A. Demers, care owner and builder, J. S. Brown, 324 Patricia; plumbing and heating—L. N. & J. C. Noiseux. Masonry, plastering and painting by day labor.

Brickwork is going up on stores and flats being built north east corner Gray and Sherbrooke, for Nathan Shribman, 5056 Sherbrooke W. The following sub-trades have been let; masonry—J. Toralli, 186 St. Margaret St.; millwork—J. Meunier, St. Jerome, Que.; plumbing —J. Tweddle, 163 Lagauchetiere. Architects, Shorey & Ritchie, 360 Beaver Hall Hill.

The following sub-trades have been let on 2 residences, $18,000, on Northcliffe Ave. Notre Dame de Grace; roofing — D. Nicholson & Co.; electric — P. Houle, 351 Angers; plumbing and heating—J. B. Staton, 2542 Mance; tiling—J. H. Dodgson, 745 Catherine W.; plastering—A. Leger, care owner and builder, Pick & Sheppard, 360 Hingston.

A. Gregoire, 417 Addington, has the general contract for residences and 2 garages, $25,000, on Park Ave., near St. Viteur, for E. Emery, 4280 Western. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Foundations are going in for 2 residences, $24,000, on Mt. Pleasant, near Trafalgar, for J. C. Rancourt, 3820 St. Laurent. General contractors are Denis Construction Co. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting, glazing, tiling and hardwood floors to be let.

Niagara Falls, Ont.

Smith Bros., Ellen Ave., are the general contractors for 2 stores and 4 apartments, $30,000, corner River Rd. and Bridge St., for Ed. M. Noonan, River Road.

Outremont, Que.

Forms are going in for $28,000 cottage on Peronne Ave. N. Deslauriers, 406 Sherbrooke East is the owner. Architect, Chas. Bernier, 70 St. Jacques. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, and tiling to be let.

Foundations are going in for 2 residences, $9,000, on Dunlop, near Ducharme, for C. P. Tucker, 2392 Hutchison. H. Taylor, 2634 Christophe Colomb is the general contractor. Sub-trades to be let.

The following sub-trades have been let on $27,000 cottage being built on Maplewood, corner McCulloch, for Jas. Moguin 1158 St. Hubert St.; roofing—M. Chouinard, 751 Adam; plastering, Frs. Beaudoin & Fils, 62 Christophe Colomb. General contractors are Collet & Freres, 243 St. Hubert St. Architects, Perrault & Gadbois, 2100 Park Ave.

Page & Laforce, 43 Marquette, have the roofing and plumbing contract for 6 flats, $18,000 on Wiseman, near Van Horne, for T. C. Casgrain, care architect, E. A. Doucet, 195 St. Catherine E. O. Rondeau, 1137 St. Denis St., is the general contractor. Balance of work day labor.

The following sub-trades have been let on $10,000 residence being built on Elmwood Ave., for Geo. Gundry, 2080 Hutchison St.; brickwork—B. Carra, 40 Dante; plastering—B. Marier, care general contractors, Denis Construction Co.; tiling—R. S. Muir, 32 Park Ave.

Ottawa, Ont.

The walls are going up for $7,000 residence on Powell Ave. Following sub-trades have been let; electric—J. Ellicott, Bank and Strathcona Ave.; plumbing and heating—Band & Cole, Bank and Third Ave.; plastering—W. Green, 105 Arlington Ave.; painting — Mr. Stroud, Bank St. G. B. O'Hara, 33 Fouth Ave., is the owner and general contractor.

Port Colborne, Ont.

Otto Eberling contemplates building 2 residences, $3,500 each, on Alexandria St. Peter Beam has the contract for masonry. Carpentry day labor by owner. Sub-trades to be let.

Toronto, Ont.

J Cook, 166 Concord Ave., has the contract for plumbing, and Frank Marette, 21 Watford Ave., the plastering contract, on 3 residences, $16,000, being built at 41-3-5 Melrose Ave. Painting by day labor. Owner and builder is Jno. Hambleton, 205 Yonge St.

The following sub-trades have been let on 1 pair residences, $7,500, west side Kingswood Rd., near Gerrard East; plumbing — Joe. Foster, 862 Kingston Rd.; heating—Rumley & Thompson, 396 Kingston Rd. Painting and masonry by day labor. Geo. Cross., 416 Kingston Rd., is owner and builder.

The following sub-trades have been let on 4 residences, $3,500 each, south side Snowden Ave., near Bocastle Ave.; electric—Taylor Bros.; plumbing—Chas. Legg, 120 Barrington St.; heating—Toronto Furnace Co.; painting—Ingram Bros.; plastering—W. Baker, 90 Main St. Owner and builder is J. E. McMillan, 164 Main St.

Sub-trades as follows have been let on 2 residences, $4,500 each, south side Snowden Ave., near Yonge St.; electric —H. Wood, 104 Nairn Ave.; plumbing —W. H. Raine, Glengrove E.; heating —L. C. Carstead, 9 Redpath Ave.; plastering—B. B. Boyl, 147 Ascot Ave. Painting by day labor. Owners and builders are Mitchell & Sheppard, 191 Eglinton.

Walls are going up for 2 pair residences, $6,000 a pair, south east corner Snowden and Ronan Ave. Owner and builder is W. E. Taylor, 22 Falcon Ave. Masonry is being done by Laugman & Taylor, 500 Soudan Ave. Carpentry by day labor. Electric, plastering, painting, heating and plumbing to be let.

The following sub-trades have been let on $15,000 residence being built on north side Mountjoy Ave.; heating—Mason & Allen, 400 Morley Ave.; electric—G. Byford, 302 Glebemount Ave. Plastering to be let. Painting by owner and builder, W. Luxton, 583 Pape Ave.

Art. Slightman, 125 Wolverleigh, is

the owner and builder of 3 pair residences, $7,000 a pair, south side Milverton Blvd., near Coxwell Ave. The following sub-trades have been let; electric —C. M. Stevens, 231 Monarch Park; heating—Howard Furnace Co; plastering — Wright & Gaunt; painting—A. J. Rance, 98 Hiawatha Rd.; masonry by day labor.

I. Maude, 19 Rowland Ave., has the contract for plumbing and heating, and Bran Bros., 72 Annette St., painting and decorating, on 2 residences, $11,000, at 107-9 Armadale Ave. Plastering by day labor. Clayton Bros., 181 Garden Ave. and 133 Perth Ave., are the owners.

The following sub-trades have been let on $15,000 residence and garage south side Heathdale Rd., near Pinewood; electric — Arthur Roots, 125 Kenwood Ave.; heating and plumbing—T. B. Smyth, 182 Avenue Rd. General contractor, Taber-Ford Construction Co., supervising balance of trades. S. S. Snider, LaPlaza apartments is the owner.

The walls are going up for 1 pair residences, $8,000, at 65-7 Bowood Ave. Owner and builder is Wm. Hodgkinson, 70 Bowood Ave. Masonry by W. Walker, 84 Day Ave. Electric, plastering, painting, heating and plumbing still to be let.

Geo. Proctor, 22 Heathdale Rd., has the general contract for $15,000 residence at 29 Whitney Ave., for W. P. King, 2 Bloor West. Painting, plastering, heating, plumbing and electric trades to be let by the architects, Belfry & Wilson, 2 Bloor West.

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Walls are going up for $10,000 residence and garage south side Dundurn Crescent, near Dundurn Ave., for C. Tallman, Northcliffe Blvd. J. W. A. Crowe, 2a Glenwood Ave., is the general contractor and is receiving tenders on electric, plumbing and heating. Carpentry and masonry by general contractor, day labor.

Gordon & Harmer, 110 Montgomery Ave., have the painting contract, and Howard Furnace Co., the heating contract, for 2 residences, $4,000 each, at 103-5 Glenforest Ave. Irwin Simpson, 11 St. Leonards Ave., is the owner and builder. Plastering by day labor.

T. Bone, 336 Keewatin Ave., has the plumbing contract for 2 pair residences, $8,000 pair, south side Teddington Park Ave., near Bocastle. All smaller trades to be let. Owner and builder is Herb. R. Wilton, 86 Teddington Park Ave.

The following sub-trades have been let on $8,000 residence being built north side Teddington Park Ave., near Yonge St., for T. W. Rea, 71 Heath St. W.; electric—E. B. Swackhamer, 1167 Bay St.; plumbing — John T. Aggett, 10 Scollard Ave.; plastering—Walter Simpson, 487 Eglinton Ave.; heating (oil burner)—Wm. Howard, 43 Howland Ave. Painting by day labor.

Vancouver, B. C.

The following sub-trades have been let on alterations for apartment block, $270,000, 800 block, Georgia St. W., owned by St. Julien Co., Ltd.; roofing, sheet metal and ventilating—Campbell & Grill; electric— general contractors, Booker, Campbell & Whipple. Architect, H. S. Griffith, 1013 Dominion Bldg., Vancouver.

The following sub-contracts have been awarded on $24,000 apartment block on Harwood Street, owned by Hugh M. Fraser & Co., Ltd.; plumbing—Frederick Woods, 1420 Seventh Ave. E.; heating (gas) Vancouver Gas Co. General contractors are Smith & Webber; architect, H. H. Simmonds, 309 Carter Cotton Bldg., Vancouver.

Verdun, Que.

Foundations are going in for 12 flats, $24,000, on 4th Ave., for Piche & Raymond, 83 Lasalle Rd. Jos. Soucisse, 1332d Wellington St. has the general contract. Masonry, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing, marble and tiling to be let.

F. X. Ledoux, 97 Edna, has the general contract for $9,000 residence on Willibrod Ave., for Rev. P. McDonald, 335 Willibrod. Masonry, millwork, roofing, electric, plumbing and plastering to be let. No materials purchased; general contractor buys.

The following sub-trades have been let on 20 flats, $60,000, being built on Ballantyne between 3rd and 4th Aves.; roofing—Jos. Labelle, 499 Atwater; electric —S. Quesnel, 309 Church Ave ; plumbing and heating—Mr. Jaubert, care owner and builder, Jos. Soucisse, 1384 Wellington; painting and glazing— A. Raymond & Co.; masonry, day labor. Marble, millwork, plastering and tiling to be let.

The following sub-trades have been let on $12,000 residence being built on Second Ave.; masonry—A. Remy, 1313 Gertrude St.; roofing—Jos. Labelle, 238 LaSalle Rd.; electric—E. Robillard, 1346 St. Joseph St.; plastering—A. Leonard, 54 Pichette. Owner and builder—Perras & Foulet, 1501 Wellington St.

Westmount, Que.

D. Nicholson & Co. have the roofing contract, and Brown & Son, the tiling, for pair residences, $30,000, on south side Cote Road, between Prince Albert & Victoria. Owner and builder is Pick & Reid, 919 Durocher.

The following sub-trades have been let on 1 pair and 1 detached residence being built on upper Lansdowne Ave.; millwork—Daniel Cream Lumber Co.; roofing—D. Nicholson & Co.; electric—P. Houle, 351 Angers; plastering—Frs. Beaudoin & Fils. Masonry, plastering, painting and glazing by owners and builders, Pick & Sheppard, 360 Hingston.

Duntile Co., Ltd., 499 Phillips Sq., have the contract for masonry on 1 pair residences, $30,000, being built on Aberdeen Ave. J. B. Fellows, 60 Nelson, is the owner and builder. Millwork, roofing, electric, and tiling to be let.

Foundations are in for 1 pair residences, $30,000, on Prince Albert Ave. Millwork—W. H. White, 77—1st Ave., Ville St. Pierre. Owner and builder is J. Hand, 4857 Sherbrooke Ave.

W. H. White, 77 First Ave., Ville St. Pierre, has the contract for millwork on $20,000 residence being built opposite 916 Grosvenor Ave. J. Hand, 4857 Sherbrooke Ave. W., is the owner and builder. Roofing, electric and tiling trades to be let.

Waterloo, Ont.

Harvey Gleiser, 7 Erb St. W., has the plumbing contract for $5,000 residence being built on Park Ave. Ellert Bros., Park Ave., are the owners and general contractors.

Windsor, Ont.

Gignac Bros., 932 Parent Ave., have the general contract for $7,500 duplex

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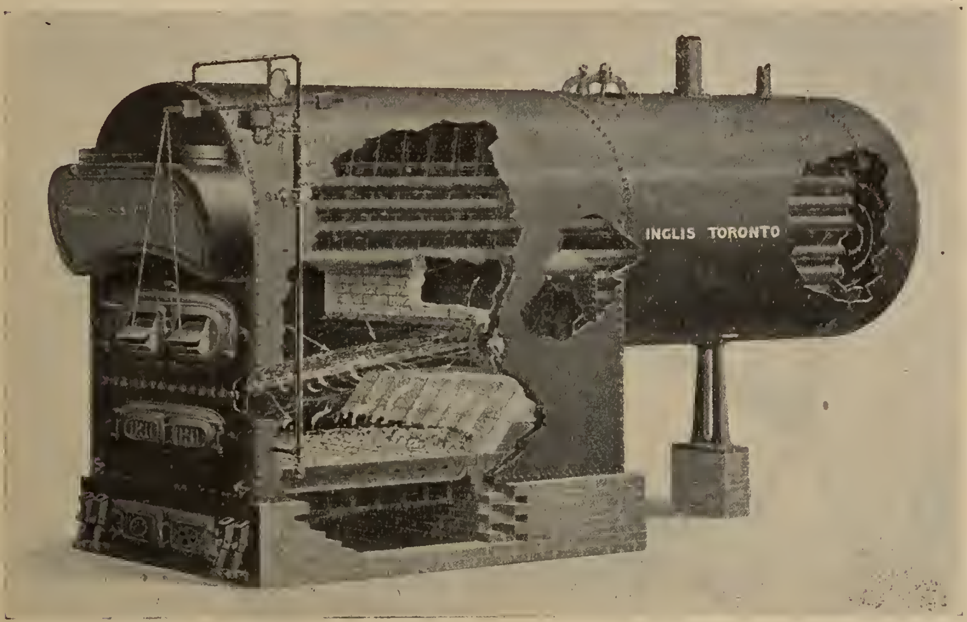

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TORONTO MONTREAL WINNIPEG VANCOUVER

residence on Giles Blvd., for C. E. Baby, Askin Ave., Sandwich, Ont. Electric, plumbing, plastering and painting to be let. No materials purchased.

Arthur Pickering, Hall Ave., has the contract for plumbing and heating on $7,500 duplex residence on Howard Ave. Owner and general contractor is Peter Osterhout, Exchange Building. Electric, plastering and painting trades to be let.

Power Plants, Electricity and Telephones

Chippawa, Ont.

Hydro Electric Power Commission of Ontario, is receiving tenders till December 13, through the chief engineer, for construction of 2 rest piers, 2 guard piers and 2 fenders in connection with M. C. R. swing bridge over Welland Canal at Chippawa. Plans and specifications with T. U. Fairlie, railway engineer, corner Centre Ave. and Elm Sts., Toronto.

London, Ont.

A By-law for the rebuilding of dam to cost $150,000 was defeated by the London ratepayers on December 3.

CONTRACTS AWARDED

Vancouver Island

B. C. Electric Railway Co., Ltd., Vancouver, have awarded Samuel Crooker, Duncan, B.C., the contract for supplying poles at $10,000, in connection with extension of high power line between Jordan River and Brentwood Bay.

Winnipeg, Man.

The city of Winnipeg has awarded the general contract for transformers to Packard Electric Co., at $2,988.

Miscellaneous

St. Catharines, Ont.

The Dept. of Railways and Canals, through the secretary, J. W. Pugsley, Parliament Bldgs., Ottawa, Ont., is receiving tenders till Jan. 15, 1924 for general construction work in connection with section 8, Welland ship canal. Plans and specifications at office of chief engineer, Dept. of Rlys. and Canals, Ottawa, and engineer in charge, Welland Ship Canal, St. Catharines. An accepted cheque for $550,000 is required.

Macdonald Engineering Co. of Canada, Ltd., C.P.R. Building, Toronto, Ont., are submitting a tender in connection with construction of section No. 8, Welland ship canal, and would like to receive prices on sub-trades.

Verdun, Que.

J. E. A. Benoit, 1200 Wellington St., W., Verdun, Que., wants prices at once on artificial stone (first quality); hot air furnace, mosaic flooring and leaded and frosted glass.

An extensive highway improvement project is going forward in Argentina. The project provides for the progressive construction of over 6,000 miles of highway within the single Province of Buenos Aires.

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Hamilton, Canada

Canadian Pacific Railway Company's Lake Terminal Elevator

The Canadian Pacific Railway's 4,000,000 bushel Reinforced Concrete Grain Elevator is located at Port McNicoll, Ont. It was designed and built by the John S. Metcalf Co. Ltd., of Montreal, and this modern and fire-proof Elevator is one of the finest in Canada.

The storage capacity is made up of 64 circular bins, 33 feet inside diameter by 80 feet in height, and has 62 interspace bins. There is also a large Working House, two travelling marine towers and Power Plant with two turbo-generators.

Due to its height and its location in the open along the Lake front, this Elevator is necessarily subjected to enormous wind pressure as well as the vibration of the Railroads operating on the ground and the machinery and conveyor equipment operating within. To meet these conditions the Engineers chose RAIL STEEL REINFORCING manufactured from standard section Tee Rails in accordance with A.S.T.M. SPECIFICATION A-16-14, and CANADIAN ENGINEERING STANDARDS ASSOCIATION Specification A-9-1923-B.

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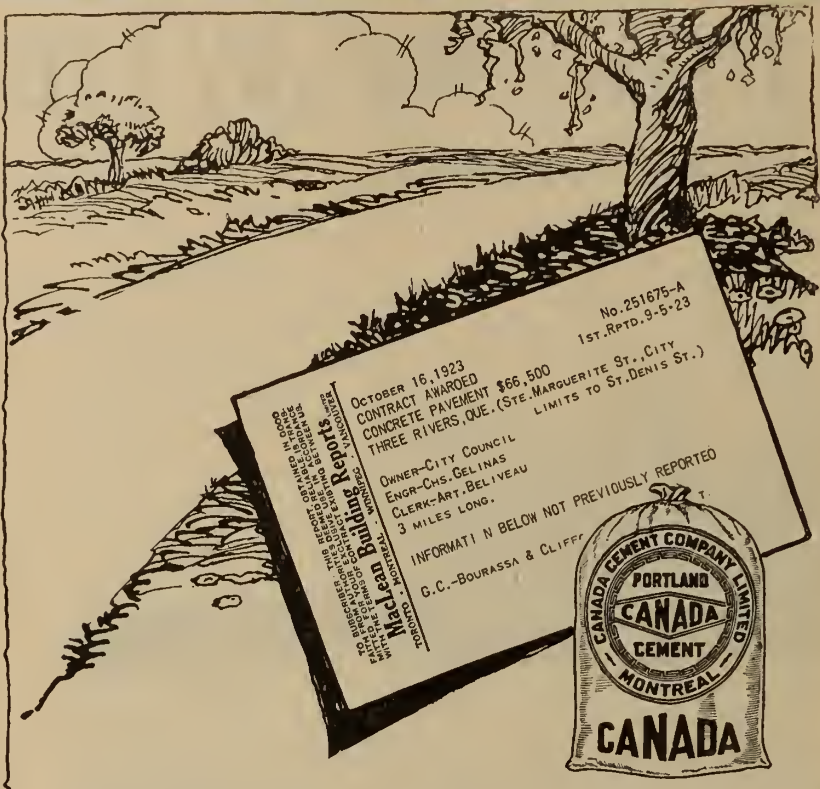
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Exporters Should Watch Translation

Faulty and incorrect translations of circulars and advertisements not only fail to convey the meaning intended by the manufacturer or exporter but frequently make a company ridiculous in the eyes of the prospective purchaser. Some years ago a saddlery manufacturer, anxious to advertise his goods in Spanish-speaking countries, sent out pamphlets concerning single-horse buggy harness which he had for export. The translator, having no idea of the subject under consideration, made a true literal translation ,and the result was "Harness full of bugs, for a bachelor horse." Vacuum cleaners have been made "cleansers of emptiness;" monkey-wrenches, "wrenches for monkeys;" iron washers, "machines to clean iron." The London Times Supplement has also recently called attention to the fact that translators in several instances have been guilty of deliberate errors in translating circulars into little-known vernaculars The result was that competitors of the concern in question were aided in the introducing of their own or similar products in the country. This was done by the addition of cryptic expressions known only locally.—Financial Post.

Prospect for Digging Artesian Wells At Guadeloupe

Manufacturers of artesian well digging machinery and equipment will be interested in a project which is being considered for the solution of the drought problem in certain islands of the West Indies by means of artesian wells. While no definite proposition is at hand it is believed there is a very good opportunity for the sinking of such wells at considerable profit to some concern which will go into the matter on a large scale (or blanket basis), making a survey of conditions tnd needs and offering a proposition that will supply the full demands. That such an opportunity exists for an elert engineering concern is evidenced by the fact that Guadeloupe is suffering not only for lack of water for irrigation purposes but because there is a poor supply of water fit for drinking purposes.

Modern Hotel for Czechoslavakia

A project to construct a modern hotel along American lines in Prague is being actively pushed by an American group with the co-operation of a number of prominent Czechs. The proposed building will have a minimum of six, but more likely eight or nine, stories, with upward of 400 rooms, the estimated cost to be approximately $2,500,000. Of this sum the Americans propose to raise approximately one-half and the balance is to be provided by local interests. Reference No. 12558.

Governments Dispose of Peat Ulant

Private interests it is understood have offered to take over from the Ontario and federal governments the peat plant at Alfred, Ont., and to operate it on a commercial basis. No cash consideration is involved, the company merely stepping in to take charge of the plant, giving guarantees that the plant will be operated and the fuel distributed in the surrounding district.

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Barrett Specification 20-Year Bonded Roof on Merchants' Bank of Canada. Arch.: H. R. Little, Montreal, Que.. Con't: Carter, Halls, Aldinger, Regina. Roofer: Hastings & Willoughby, Regina.

Barrett Specification Roof on Saskatchewan Cooperative Creameries. Arch.: J. H. Puntin. Con't: Poole Const. Co. Roofer: W. S. Johnston. All of Regina.

Barrett Specification 20-Year Bonded Roof on Saskatchewan Gov't Police Bldg. Arch.: M. W. Sharon.. Con't: Poole Const. Co. Roofer: W. S. Johnston. All of Regina.

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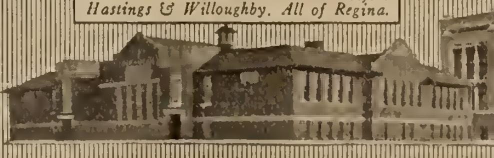
Barrett Specification 20-Year Bonded Roof on Kitchener School. Arch.: J. H. Puntin. Con't: Wilson & Wilson. Roofer: Hastings & Willoughby, All of Regina.



Barrett Specification 20-Year Bonded Roof on Lakeview School. Arch.: J. H. Puntin. Con't.: H. G. McVean & Co. Roofer: Hastings & Willoughby. All of Regina.

Barrett Specification Roof on Saskatchewan Cooperative Elevator Co., Ltd. Arch.: Storey & Van Egmond. Con't: Poole Const. Co. Roofer: W. S. Johnston. All of Regina.

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	68-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.60 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.75 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50—6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
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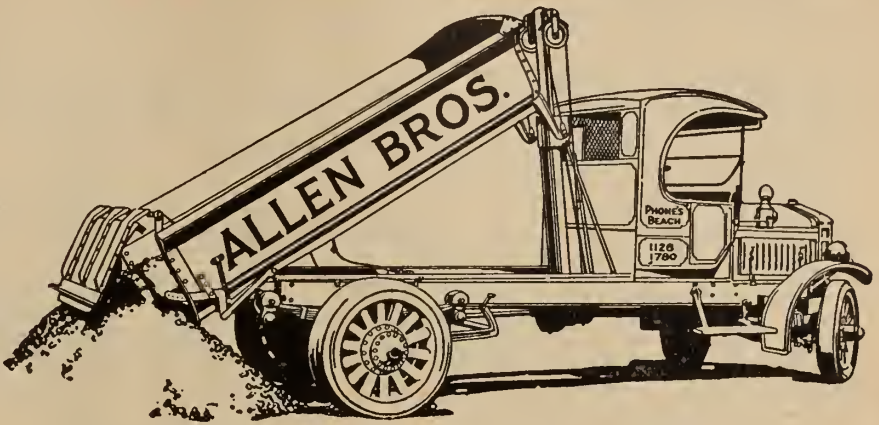

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	41/45	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	45/60	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.00	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.17	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50
LABOR:—					
Bricklayers	per hr.	1.00	.80-.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50-.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70-.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60-.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55-.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40-.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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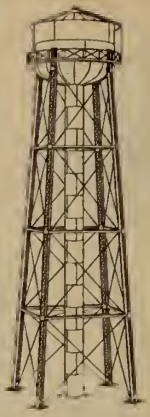

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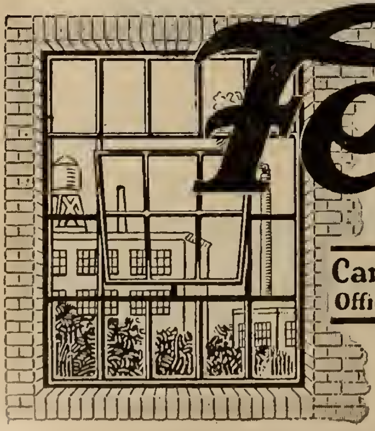

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"Elasticity and Strength of Materials Used in Engineering Construction," Section 3. Theory of Torsion in Shafting and Double Bending of Plates, recently published by C. A. P. Turner, C.E., price $5.00.

"Estimating Building Costs," by Charles F. Dingman, first edition, published by McGraw-Hill Book Company, Incorporated. 240 pages. Price $2.50.

"Hand Book of Hydraulics," by Horace Williams King 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $2.50.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $1.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Reinforced Concrete Construction", Volume 1, by George A. Hool, S. B. Second edition, published in 1917, 254 pages, illustrated. Price $2.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $1.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $1.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $1.50.

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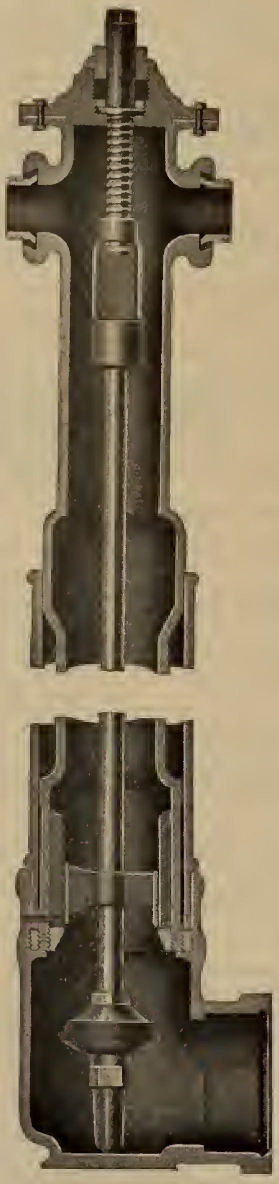

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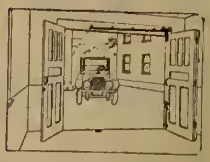

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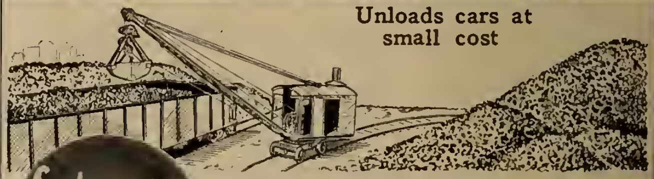

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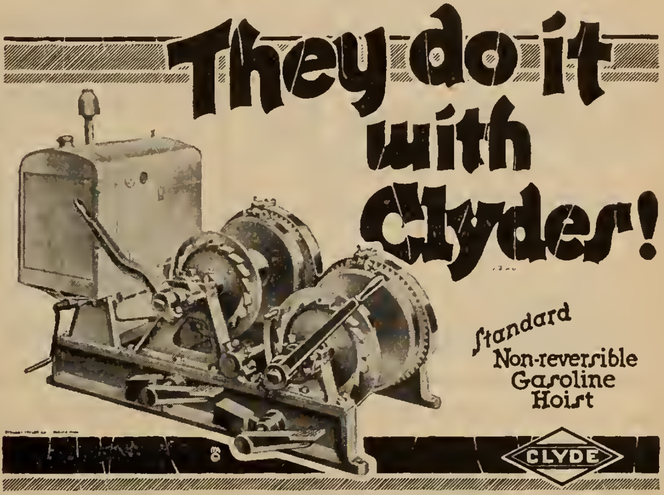

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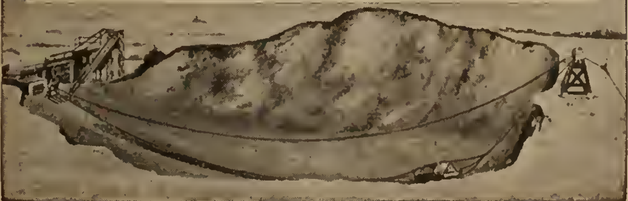

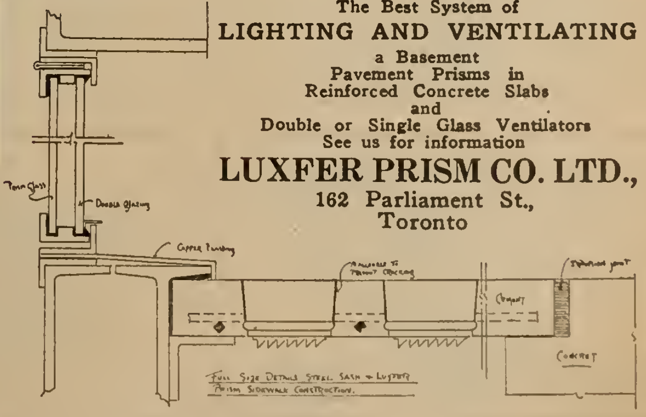
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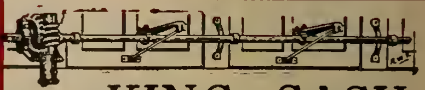

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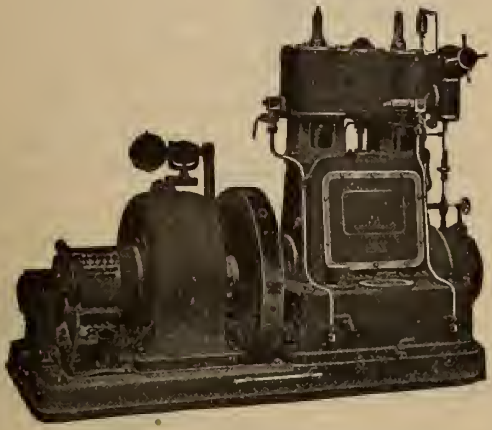

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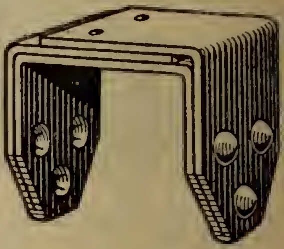

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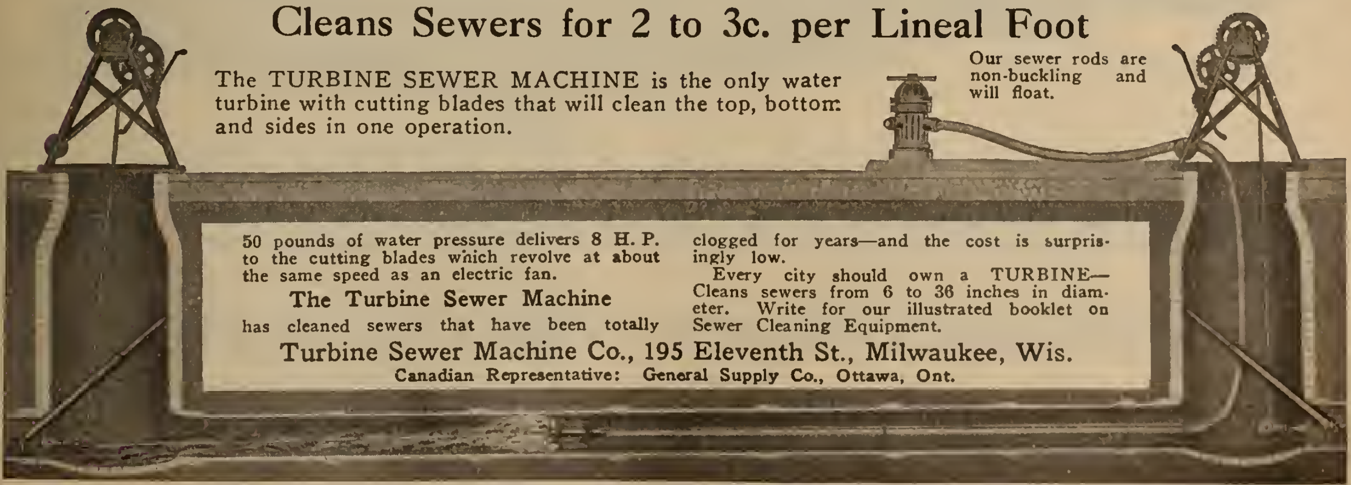

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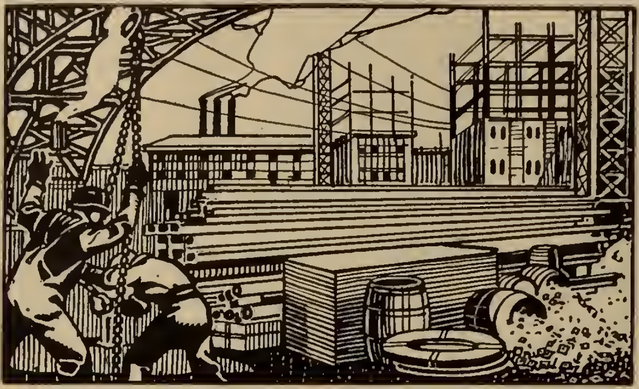

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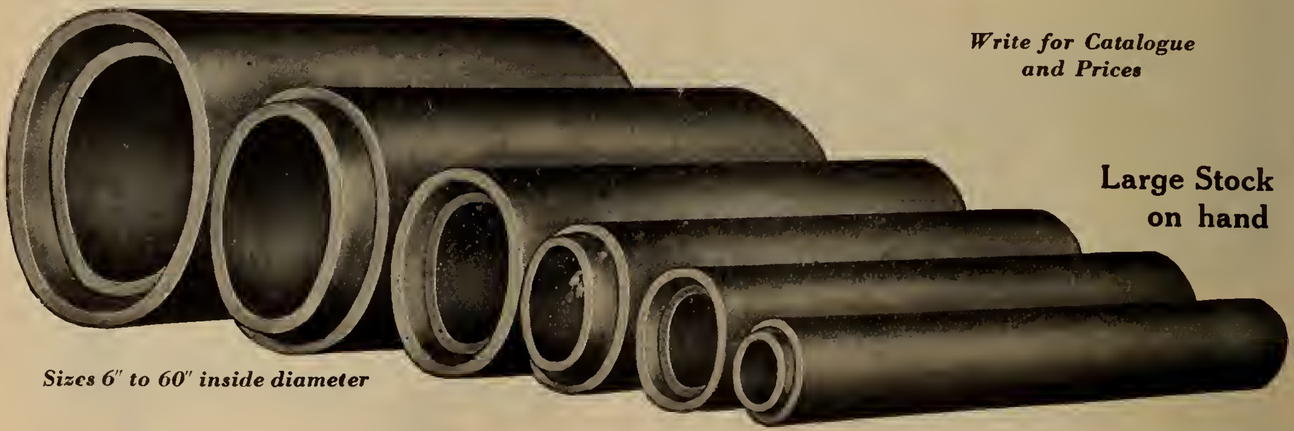

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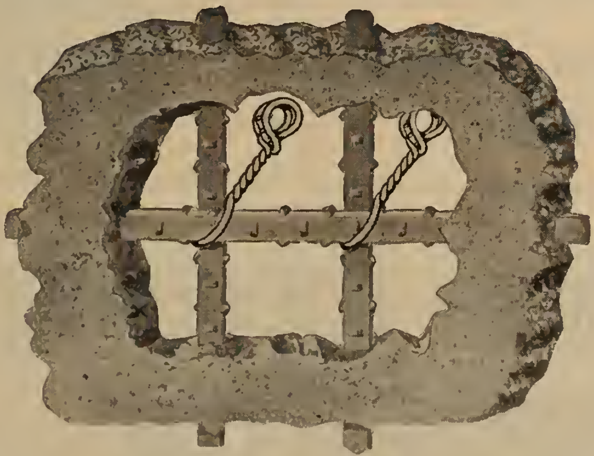

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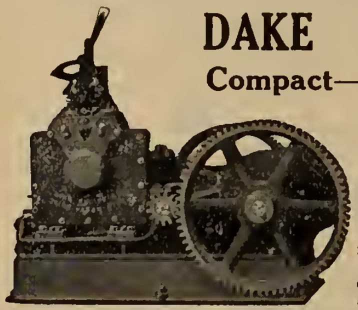

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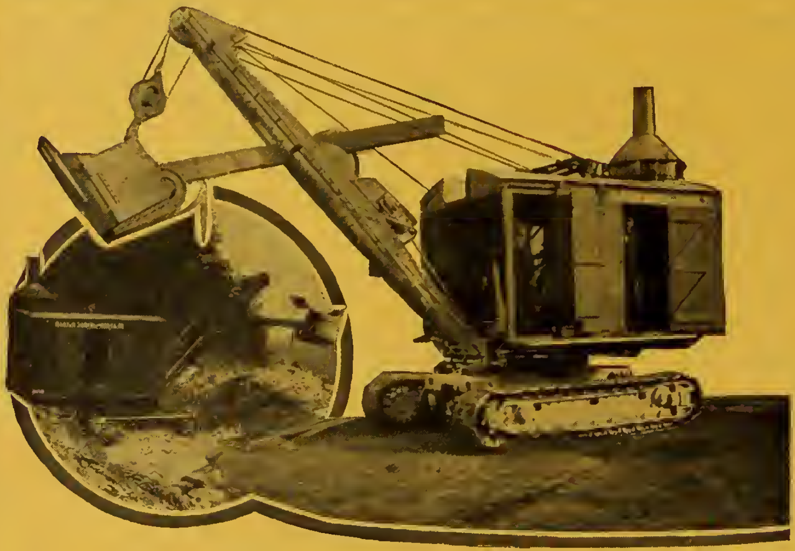

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Vol. 37 Toronto, December 19, 1923 No. 51

Contract Record and Engineering Review

1924 CONFIDENCE 1924

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Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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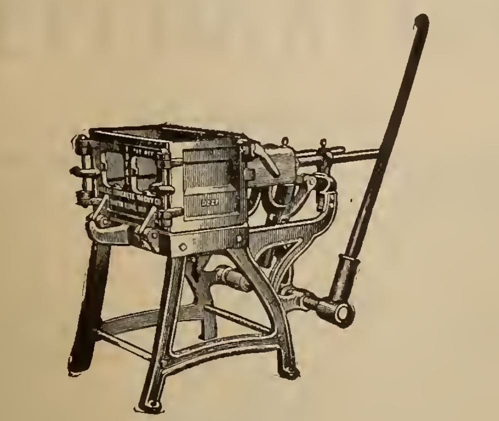

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—Fully described in Catalogue No. 22-B-1

Ideal Concrete Products Plants everywhere have been enjoying prosperity during the past year. **WHY?** Because the Ideal Concrete Blocks are now recognized as standard building materials and in large demand in every vicinity where buildings are being erected.

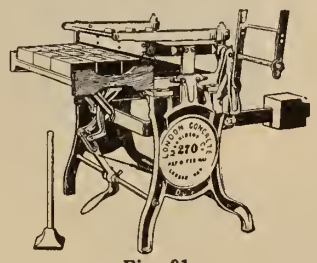

Fig. 91

LONDON CEMENT BRICK MACHINE
Hand Power

Capacity, 5,000 bricks per day. Makes brick with smooth faces on all sides and with frog impression. This is the best hand-operated cement brick machine on the market. Brick can be made on the ground where building is to be erected. There are big profits in the manufacture of Cement Brick.

—Described in Catalogue U.

The machines illustrated herein are all that is required to start in the business. A complete plant can be installed for a few hundred dollars. The profits in the business will more than justify the expense.

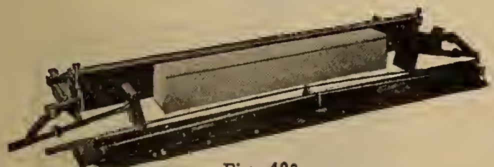

Fig. 430

LONDON ADJUSTABLE SILL, STEP AND LINTEL MOULD

The London is the Only Absolutely Adjustable Mould on the market. It makes sills, steps and lintels any size, and with any bevel. Saves the price of itself in one building. —Described in Bulletin O-R-S

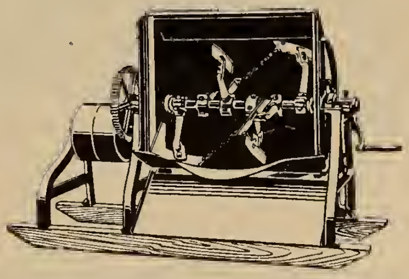

Fig. 6051. London Chain Spade Mixer, on Skids With Tight and Loose Pulley

This machine is particularly suitable for stationary plants, for mixing semi-wet concrete for making concrete blocks, tile, or cement brick. This kind of concrete requires considerable tempering with a very small quantity of water. The London Chain Spade Mixer was designed particularly for this class of work.

—Described in Bulletin 49-M-1

What we have done for others we can do for you

Full particulars on request.

Made in Canada

We manufacture concrete Mixers, Hoists, Elevators, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

Worlds Largest Manufacturers of Concrete Machinery

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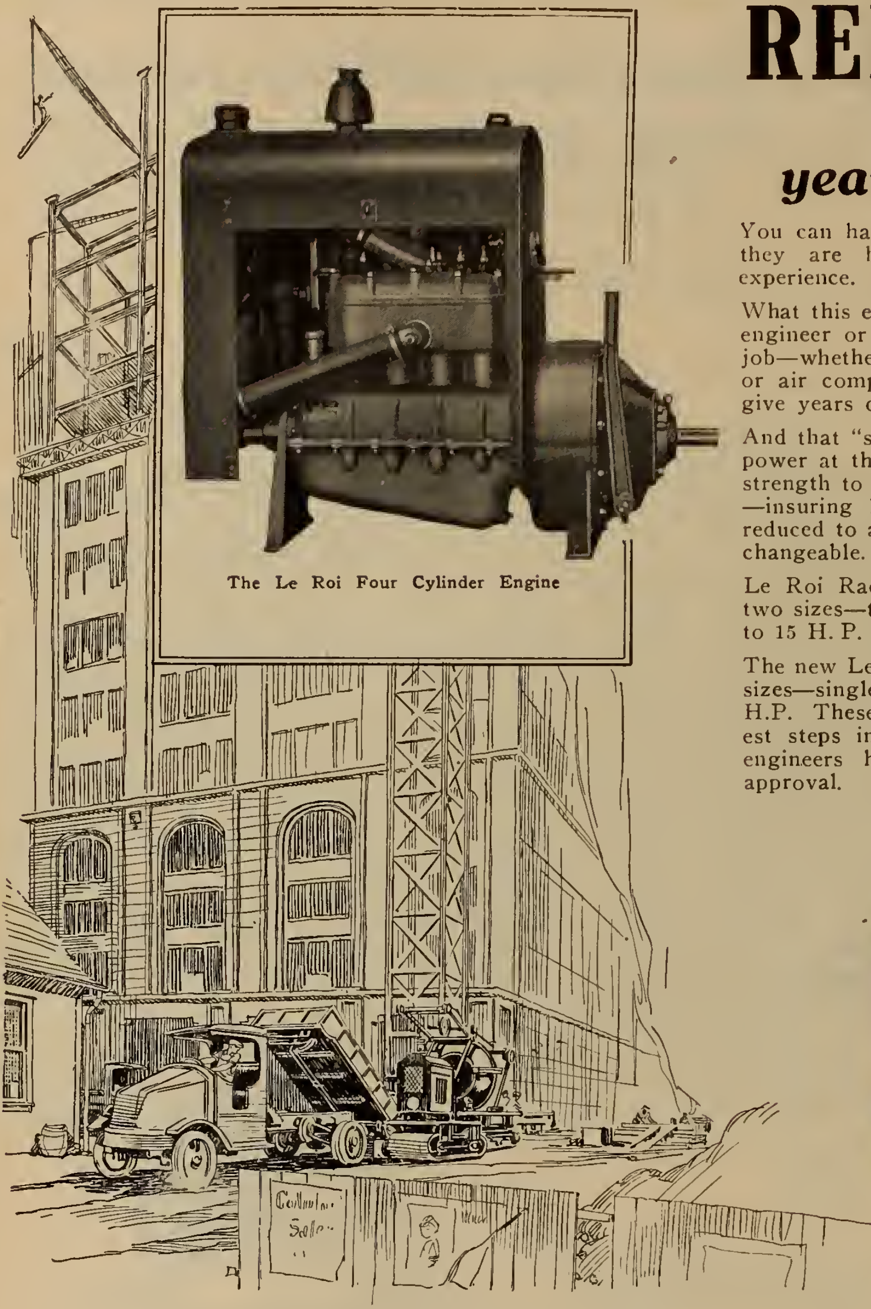


The Le Roi Four Cylinder Engine

RELIABILITY

backed by years of reputation

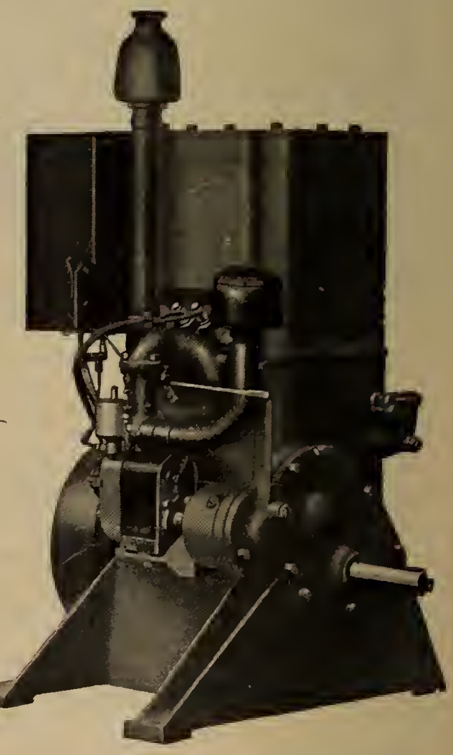
You can have confidence in Le Roi Engines. For they are backed by years of engine building experience.

What this experience means to you as a contractor, engineer or builder is that your power unit on the job—whether for the concrete mixers, pumps, hoists, or air compressor—is designed and built right, to give years of uninterrupted service.

And that "service" means plenty of steady, unfailing power at the lowest possible operating cost. Extra strength to give extra power is built into every part —insuring long life, and reliability with vibration reduced to a minimum. All wearing parts are interchangeable.

Le Roi Radiator cooled type engines are made in two sizes—two and four cylinder—furnishing from 5 to 15 H. P.

The new Le Roi Hopper cooled type is made in two sizes—single and double cylinder—furnishing 3 to 8 H.P. These engines are considered one of the greatest steps in engine construction. Contractors and engineers have already given them their hearty approval.



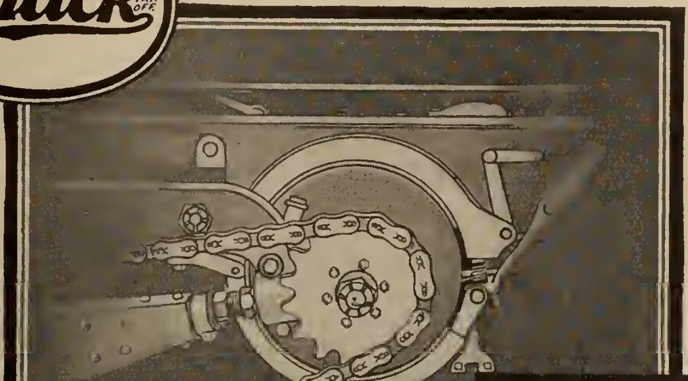
If you want to know more about the quality and reputation of these famous engines, let us send you an interesting folder illustrating and describing in detail the various types and sizes.

Le Roi Company
5906 Mitchell Street
Milwaukee Wisconsin

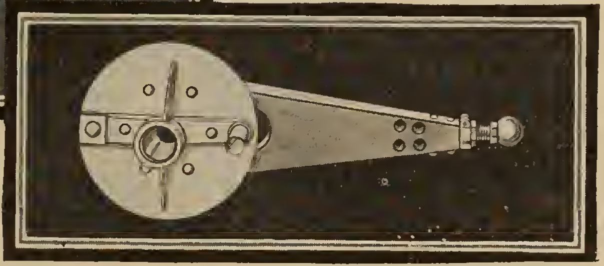
LE ROI ENGINES

"for dependable power"

Mack REG. U.S. PAT. OFF.



Exclusive Features
Nos. 16 & 17



The front sprocket
The pressed steel radius rod

WHEN the International Motor Company developed a drop-forged front sprocket, case-hardened its teeth and used it in conjunction with hardened chain rollers, the present-day efficient Mack chain drive was made possible. This drive not only performs efficiently and economically under normal going but has no equal when operating under adverse load and road conditions.

The Mack pressed steel radius rod is made in channel section and is lighter for a given strength and more flexible than common cast rods. This construction assures unvarying chain centers under all driving conditions. The large ball joint at its front end permits a single connection that adjusts itself to chassis movements. It is held by a socket that forms part of a drop-forging bolted to the chassis frame independent of the jackshaft.

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(Continued on page 8)

Storage Yard of Doolittle Russell Ltd., Hamilton, Ont.

These Bins Were Made By The Hamilton Bridge Works

Company Limited

If the remarkable story of Doolittle Russell Ltd., of Hamilton, Ont., were written in one word, it would be none other than "Service." And this "Service" which they are enabled to give their clients is made possible by the splendid equipment maintained.

In the photograph above is shown the four large-capacity steel bins, providing respectively for 2-in. crushed stone, 1-in. crushed stone, ½-in. stone screenings and concrete sand. Each bin is fitted with two spouts, closed with counterweighted gates. It was these bins which played such an important part in the erection of the Lister Building. Read the account on page 1206 of this issue.

Is the money spent for equipment of this kind an expense or an investment? Ask Doolittle Russell Ltd.!

Check over your own list of equipment. Is it sufficient to your needs or are you sacrificing efficiency to save the moderate outlay involved?

If you decide that additional hoppers, bins, etc., are needed let us quote the prices.

THE HAMILTON BRIDGE WORKS COMPANY
LIMITED

Head Office and Works - Hamilton, Canada
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(Continued on page 10)

At the Trail's End of the Year

We are glad of the opportunity kindly custom affords us at this Christmas season to lay aside business for the moment and to extend to all our friends and customers good wishes and the season's greetings.

You and we are engaged in a worth-while task— a task which is a constructive contribution to the advancement of civilization and one in which both of us may well be proud to have such important parts; you as engineers and builders of concrete roads and permanent structures; and we, as manufacturers of staunch, dependable Heavy Duty pavers, mixers and cranes. And our position in the industry spurs us on to constantly increasing efforts to further improve and perfect this equipment so that we may be of even greater help to you, who are dedicating your lives to this great undertaking.

We therefore wish you a Merry Christmas, with twelve months of prosperity, fifty-two weeks of good health and three hundred and sixty-six days of happiness in 1924.

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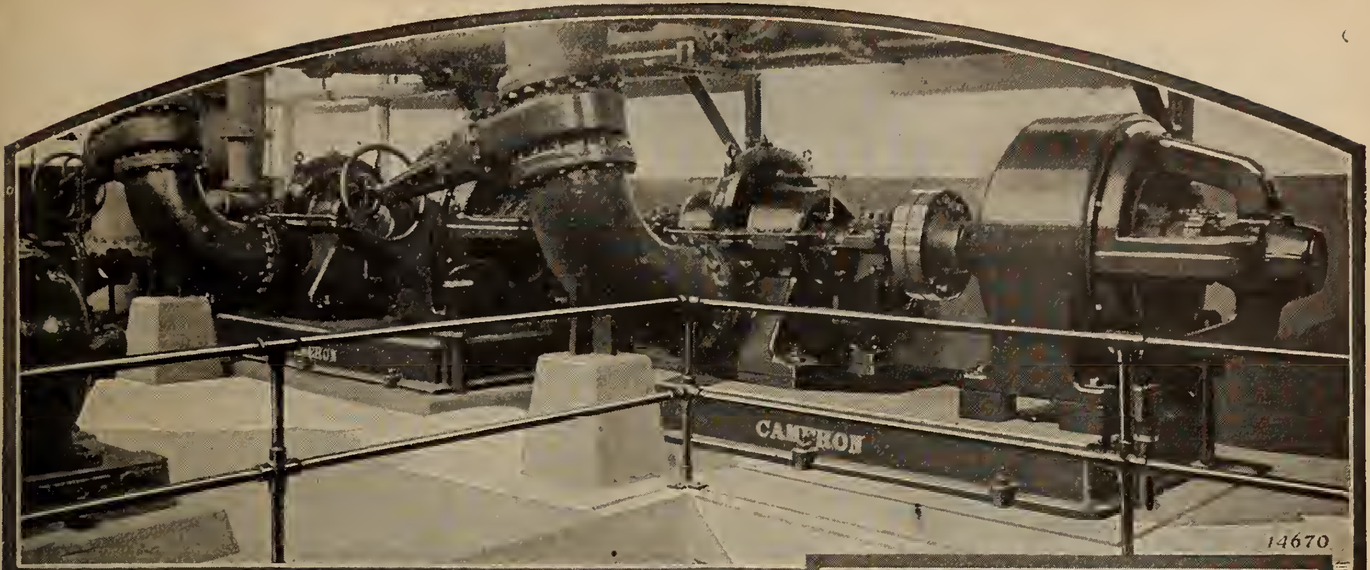

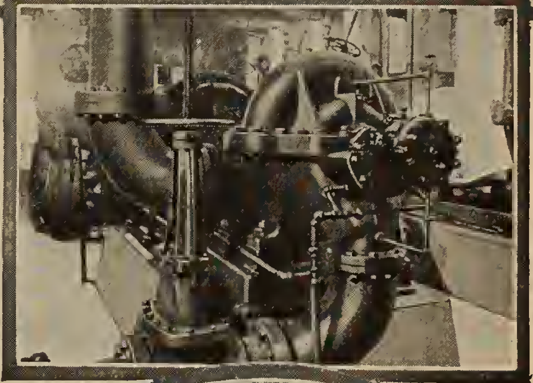

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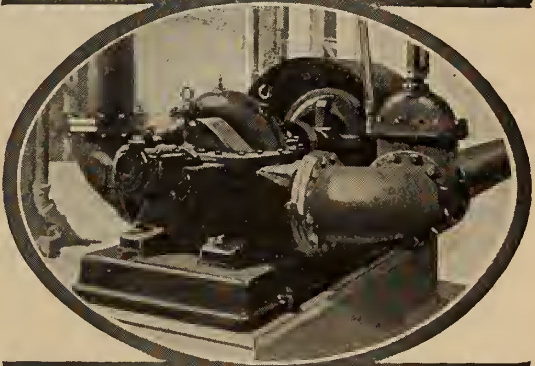

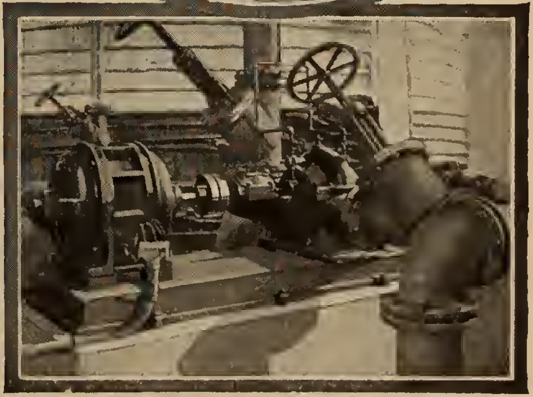

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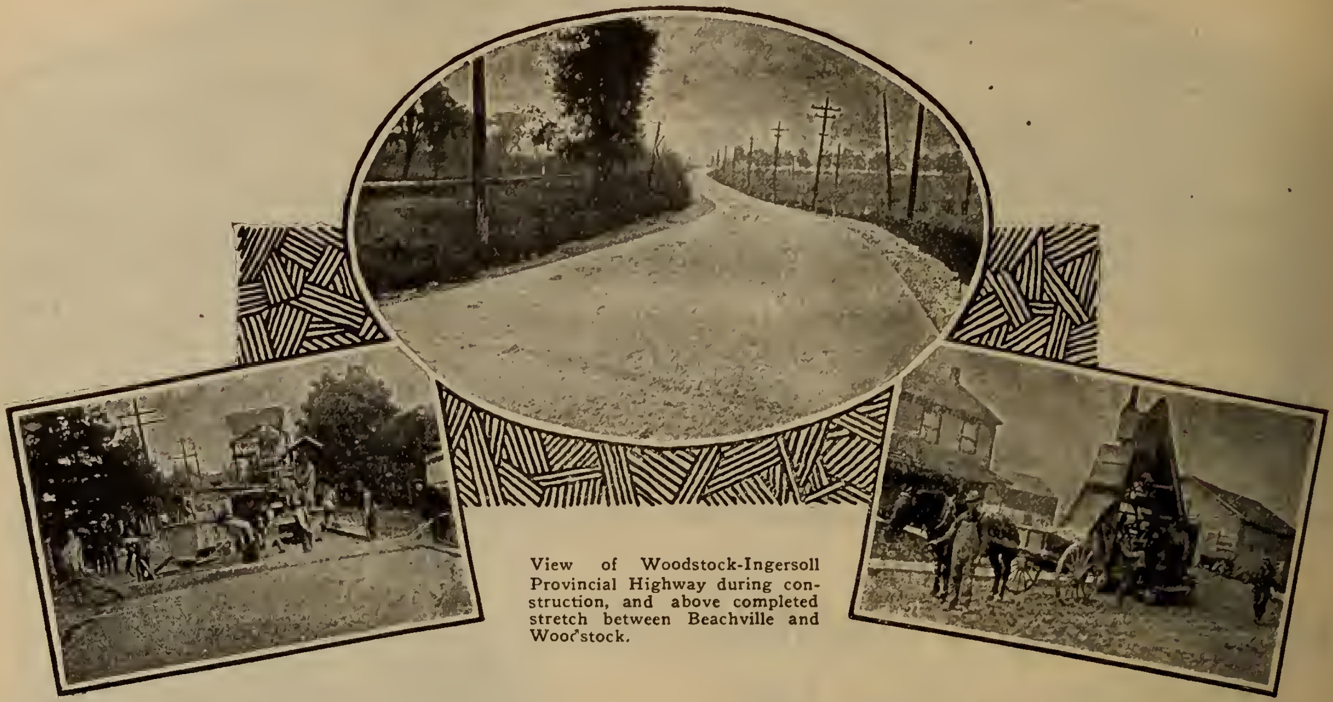

View of Woodstock-Ingersoll Provincial Highway during construction, and above completed stretch between Beachville and Woodstock.

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The requirements of modern traffic are best met by highways of modern construction—built for permanence with concrete. The known ability of this modern material to resist climatic conditions and heavy traffic together with the reduction in motive power costs it ensures, explains the rapidly increasing mileage of permanently paved Canadian highways.

Highways of concrete require very little upkeep. They lighten the taxpayer's burden and reduce haulage costs. Farmer and consumer alike, feel the benefit of this and the whole community is helped by the tourist trade such highways invite.

Literature on Concrete roads will be gladly sent on request. It shows the true economy of concrete for building enduring pavements. Write our Service Department for this, or any other information on Concrete.

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MUSSENS M LIMITED

BARBER-GREENE

No. 1 shows a Barber-Greene which provides a flexible loading system for the Pipkon-Marggraff Company of Milwaukee. The Barber-Greene requires only one man and can load a truck with 5 cubic yards in 3 minutes. Further details below.

2

No. 2 and 3 show a Barber-Greene being used for stripping by the Continental Products Company of Caledonia, New York. No. 4 shows Barber-Greene U-Type Conveyor used for loading gravel by the District of Burnaby, Canada.

3

4

Providing a flexible loading system for washed sand and gravel

A washed sand and gravel plant in Wisconsin had a difficult loading problem to solve. Its sand and gravel are pumped from the adjacent pit and are finally discharged into storage piles. Each size, of course, is stored in a different pile.

Very often the sand in these piles, except that at the edges, is too wet to be sold. In order to load all the salable sand as soon and as fast as possible, an extraordinary flexible method of loading had to be found.

After investigating, it was decided to use a Barber-Greene.

It proved that it could load a maximum of 250 cubic yards of washed sand and gravel per day.

It proved that it could load a truck with 5 cubic yards in 3 minutes.

It is operated by one man. No help is needed; the automatic disc feed cleans up as it feeds.

In every way Barber-Greenes provide the flexible fast, economical system of loading that the conditions require. They move around under their own power to a pile where there is sand or gravel of the right size that is dry enough to be sold. They load as many trucks there as there is material available and then move on to another part of the pile, or to another pile, and load there.

There are, of course, many other methods of using Barber-Greenes in sand and gravel plants.

For additional information send for our sand and rock handling literature.

Also note photograph No. 4 showing the Barber-Greene U-Type Conveyor.

The base price on this conveyor has recently been reduced to $350.

Send for prices covering electric or gas engine equipment.

Ask our nearest office for particulars

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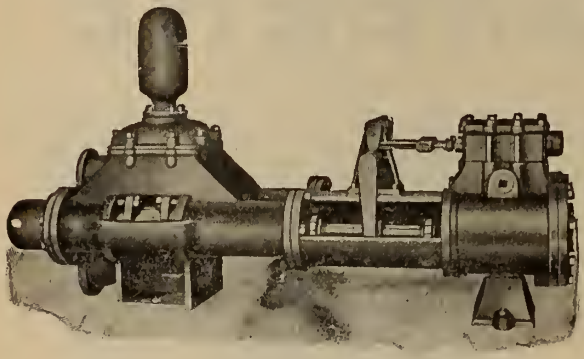

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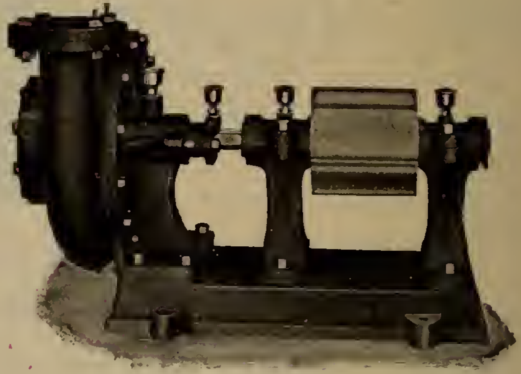

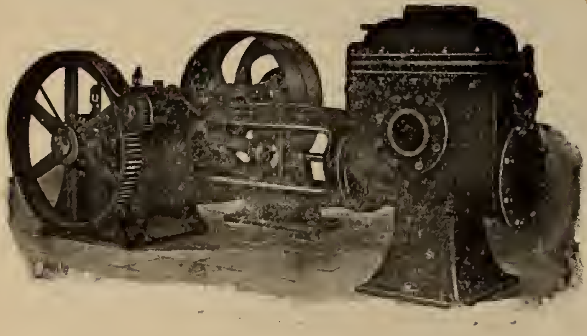

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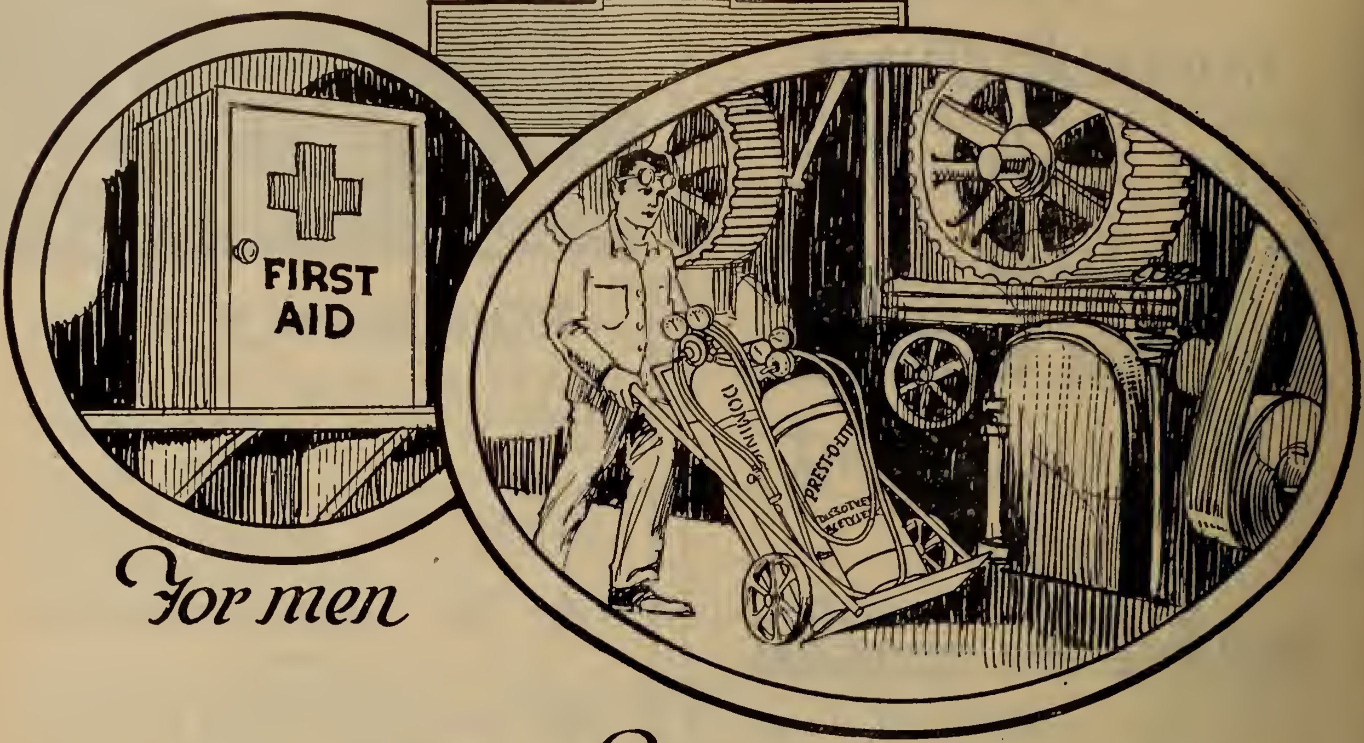

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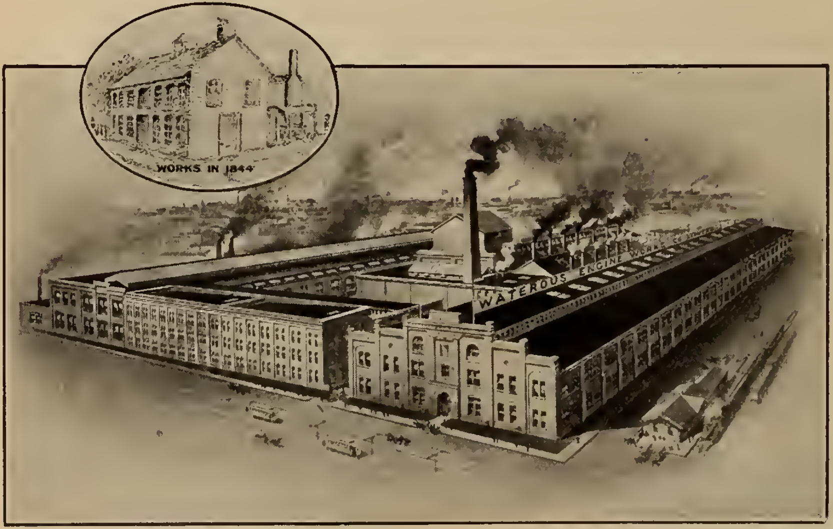

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Contract Record and Engineering Review

Devoted to Construction and Engineering

Vol. 37 Toronto, December 19, 1923 No. 51

A general view of the Indian Chutes development

New Power Plants in the North Country

Indian Chutes Plant of the Great Northern Power Co. and the Sturgeon Falls Plant of Northern Canada Power Ltd. Are the Latest Developments

The Indian Chutes plant of the Great Northern Power Company is located on the Montreal River, 12 miles above Elk Lake. The original falls had a head of 20 feet, but with controlled water elevation a head of 48 feet is now attained. The average low water flow is 450 to 500 c.f.s., the greatest flood discharge recorded 11,500. Ample provision has been made for flood conditions in the construction, the sluicing having a discharge capacity of 30,000 c.f.s., a safety factor of over 100 per cent.

The isolated situation of the power site necessitated the building of sidings and docks, where the T. & N. O. passes closest to Elk Lake. For the transportation of equipment 3 scows of 40 tons capacity each, were used. These were hauled up the 12 miles to the site by gasoline boats. At Indian Chutes there were also constructed a dock and tramway, the tramway car having capacity to handle the heaviest machinery. The construction included an inclined trestle, a hoist being used to haul the car up from the scow. The cement shed and concrete plant are located at the head of the hill at end of tramway.

Camp construction included the building of cookery and bunk camps for 150 men, water system and fire protection with a 3,000 gallon wood stave tank on a 40 foot tower. The pumping plant consists of 2 steam driven duplex pumps, one 200 g.p.m. and one 100 g.p.m. These had a big job during the fire of 1922. With 1000 feet of hose and 100 men working they saved the camp.

Construction Plant

The concrete plant for the job consisted of a one cu. yd. Smith cement mixer, and one 120 ft. tower. All the concrete in the dam and headworks was put in by chutes, after being hoisted up tower. The sand and rock bins discharged directly into mixer. At the power house there was a separate concrete plant for the ½ yd. mixer, where a 50 foot tower was used. All earth excavation was taken out by a derrick and clam shell bucket of one cubic yard capacity. All the sand required for concrete was excavated by derrick and clam, swung on main tramway, and dumped into bin at mixer. Drilling on rock was all done with an Ingersoll-Rand 43 fitted for steam. The concrete in the headworks was all poured in December and January. The backs of the forms were housed with tarpaulins and heated with live steam. All the rock excavation in the pipe line cut was hauled to the head works on cars and dumped into the rock fill dam by the derrick on top of headworks. All the rock necessary to complete dam and headworks was dumped in this way. Hoist from headwork picked up skips and dropped them direct into dam.

The construction of a new river channel was one of the most striking pieces of work on the job. In order to wash out the new river channel a small ditch was dug through, below and in front of dam, and when river rose by blocking old channel with rock fill, sluiceways were opened and water used to wash new channel down to bedrock. Approximately 100,000 cubic yards were washed out in five hours.

Power house of Sturgeon Falls plant, under construction, looking downstream

Power house construction is of reinforced concrete, gypsum slab roof, steel sash, concrete floor. A 15 ton hand operated travelling crane is used. It rests on a rock foundation.

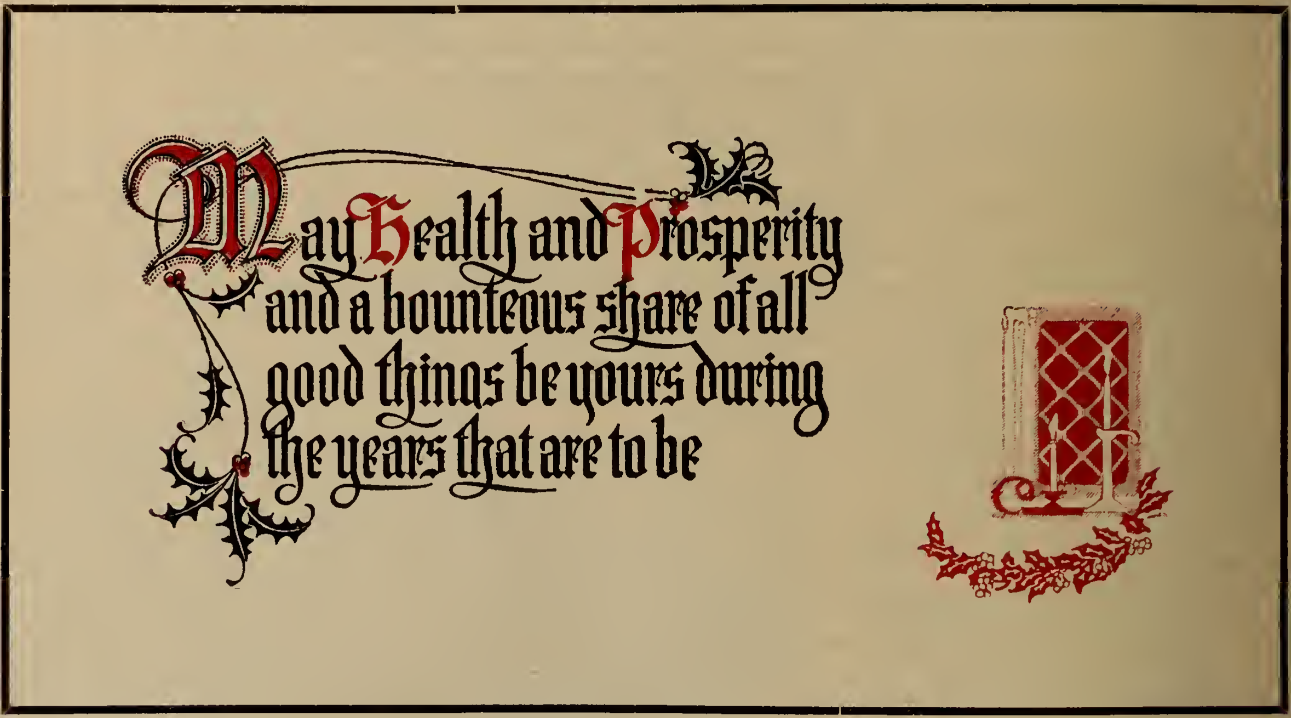
The flume is a wood stave pipe, of B. C. fir, nine feet inside diameter, 412 feet long. It is laid in a cut through the rock, and is made big enough for the ultimate capacity of three lines, 3500 yards of rock being excavated.

The entire design and construction was carried out by Sutcliffe and Neelands, of New Liskeard, Mr. T. S. Armstrong being resident engineer.

Northern Ontario's hydro-electric resources are still further augmented by the Sturgeon Falls plant of Northern Canada Power Limited, which has just been completed. This development is tied in with the Sandy Falls and Wawaitin Stations of the same company, at the Timmins sub-station, thus providing a three-fold source of energy for customers.

The plant is located at Sturgeon Falls on the Mattagami River, a distance of about 30 miles northwest from Timmins. Advantage was taken in the design of the presence of an island, and the actual work was found to fit in very nicely with anticipations. The dam is of concrete, combination Ogee and pier type, about 500 feet long. Construction was carried out along the usual lines, first the unwatering of the main channel, through the provision of temporary sluiceways, and then the power house excavation, followed by the concrete work. A one yard mixer was used and crushing was done by a No. 6 Austen machine. All work was elevated to a bin above the mixer. Concrete was put in by chutes from an elevated truck. Practically the entire power house was built in the winter time, steam being used for heating.

As the plant is comparatively isolated, the transportation of heavy machinery to the site was a considerable job. It was accomplished by using scows from Timmins. These carried the parts to the site of the Sandy Falls plant. Here a mile portage was necessary, and the heavy pieces were dragged on skids. Scows completed the trip to the site.


May Health and Prosperity
and a bounteous share of all
good things be yours during
the years that are to be

The Operation of Chatham's Refuse Incinerator

A Series of Questions and Answers That Outline the Nature of the Plant and the Results Obtained From It

By C. H. R. FULLER
City Manager and Engineer, Chatham, Ont.

We have so many requests coming from various municipalities, asking for information on the operation of our garbage and refuge incinerator, that we have prepared a list of questions and answers giving information exactly as the case is, so that the person asking for the information may have every conceivable question answered.

This city constructed the incinerator in November of 1922. Previous to that time it took about a year and a half to decide the location, and to get a type of incinerator suited for that location, and suited for local conditions existing.

The questions and their corresponding answers are as follows:

(1) What is the population of the city of Chatham? Ans. 16,000.

(2) Who collects the garbage from houses and hauls to plant—city or contractor? Ans. Contractor.

(3) How much does this cost per annum? Ans. $5,500.00

(4) Are the ashes collected independently of garbage? Ans. Yes.

(5) What is the nominal or rated capacity in 1 working day of 10 hours? Ans. 20 tons.

(6) What is the capacity as rated by manufacturer in 24 hours? Ans. 45 tons.

(7) Is the plant operated 24 hours or in the day time only? Ans. Day only.

(8) What was the first cost of plant complete without site? Ans. $30,184.85.

(9) How much did the furnace cost, Ans. 2 units at 10 tons—$10,791.00.

(10) When were the furnaces constructed? Ans. November 1922.

(11) Who constructed the furnaces? Ans. The Canadian Incinerator and Furnace Co., Toronto.

(12) Who constructed the building and general layout? Ans. Designed by city engineer's department and constructed by local contractor, Geo. W. Cutter Contracting Company.

(13) Who constructed the chimney? Ans. William Summerhayes, Rochester. It is a radial brick chimney 100 ft. high, and cost $2,792.00.

(14) What is the average temperature of furnaces used to incinerate? Ans. 1000° F. to 1300° F.; often as high as 1700° F.

(15) How much coal or fuel is required to bring furnaces to proper temperature? Ans. A fuel oil plant is used only in case a very bad garbage is delivered at the plant and in the summer time a rag soaked in fuel oil starts anything going.

(16) What is the fuel cost of incinerator per ton of garbage? Ans. In winter about 30c per ton; in summer, nothing.

(17) What is the amount of garbage destroyed each working day? Ans. 9 to 11 tons average except Saturday.

(18) Is any additional fuel required after furnaces have been brought to proper temperature? Ans. Usually no; sometimes in winter we use considerable fuel oil but total cost for fuel oil per annum is only about $250.00

(19) What do you do with the tin cans and clinker which come out of the plant? Ans. Collect one load each two days and haul to dump.

(20) Are you as an engineer or citizen, favorable to the garbage incinerator having as central a location as possible to reduce hauling costs, or do you prefer a site at the city's edge with the accompanying higher hauling costs? Ans. We have been through this stage and have discovered that the public of a small city prefer to pay the higher hauling costs. Personally we think the plant should be in the centre of the city or as near there as possible.

(21) Have you had any complaints regarding the plant from adjoining residents or industries that were well founded? Ans. We have never had any complaint because there is no nuisance of any kind. The furnaces are operated very carefully, and cleanliness is insisted upon.

(22) Do you put ashes through the plant or do you dispose of these elsewhere as filling, etc? Ans. No. We do not put anything through the furnaces but garbage and combustible rubbish and tin cans.

(23) How many men do you use to operate the plant and what is their wage? Ans. One man at $100.00 per month.

Actual Experience With Winter Building

Speakers Before the New York Building Congress Show that Cold Weather Construction is Practicable and Profitable—Lower Prices and Higher Output Claimed

"With an expenditure of $3,863 for protection of workers and materials and for heating, there was a saving of $87,710 on a job which cost $750,000," stated J. W. Lowry, Jr., at a recent meeting of the New York Building Congress, during which he submitted that winter construction was both practicable and profitable. Giving details he said:

Considering the bricklayer production in the summer of 1922 as 100 per cent., in the erection of this job during the winter of 1922-23, the bricklayer production was 109 per cent. This last summer, the bricklayer production was 91 per cent. On this job, carried on during the winter, therefore, I produced 18½ per cent. more brick per day per man than I was able this last summer.

Bricklayers got $10 a day. The payroll was $28,150. If the work had been conducted this last summer of 1923, the dropping off in production, or in efficiency, if you so choose to call it, would have added $5,360 to the cost of bricklayers alone. If the bonus of $4 be included, that is $14 per man per day, the bonus would have cost $11,260 more. In other words, the brickwork on this job would have cost $16,890 in addition to the $28,150 actually paid. The payroll for bricklayers, carpenters, labor and engineers amounted to $130,667. If the work had been done last summer rather than the previous winter, the dropping off in production and the bonus award would have added $25,680.

In addition to the saving in labor on this job, the saving on materials and in sub-contracts amounted to $16,030 compared with prices in the summer of 1922. Between labor and the purchase of materials and sub-contracts, then, there was a saving of $87,710 on building work which cost $750,000. To offset this sum, the expenditures for winter construction were: Temporary protection to labor and material, $871; tarpaulins cost $667, with a salvage of $442, net cost $225; temporary heat, $668; salamanders, $302; coke, $304; boiler attendants, $1,036; coal for boiler heating $150; temporary lighting, labor and service, $196, and snow clearing, $111. These are a total of $3,863, or about one-half of one per cent. of the total cost of the job.

Concrete Work is Practicable

That working with concrete during the cold season is practical from every standpoint was explained by W. J. Barney, president of the Barney-Ahlers Construction Co. He said:

From our files, I have taken three typical contracts, and the amounts given under the total contract column are practically for the reinforced-concrete structure, the enclosing walls, sash and roof, in other words, for that part of the building which requires protection from winter winds, freezing and cold in the course of construction. Once the building is enclosed, the matter of heating for the finishing trades is comparatively simple, especially if the permanent heating plant has promptly followed up the structural work. In a general way, about 5 per cent. of the contract represents the cost for winter protection.

Total Contract	Time of Protection	Cost of Protection	Percentage Costs
$263,000	Dec.-Jan.	$13,000	5
180,000	Dec.-Jan.	8,800	4½
95,000	Jan.-Feb.	6,300	6½

This, however, does not represent the true cost of winter construction, as the cost of this winter protection, especially under present conditions of the labor and material markets, is more than offset by the lower cost of materials during the winter, the absence of bonuses paid to mechanics and the greater efficiency of mechanics under conditions when work is not so plentiful.

Take the past year for example, we find that lumber purchased in June would cost approximately 10 per cent. less if purchased in November. We find that roofers, or ¾-in. boards, which enter so largely into form construction, are purchased for $1 per thousand less in November than in August. We find that common brick entering into the curtain walls is purchased for $3 less per thousand in November than in August. We find that reinforcing steel is purchased for 7c. per hundred pounds less in November than in August, and we know that cement has had its seasonal drop.

Moreover, it is a matter of common record that during the past summer bricklayers were paid $14, $16 and $18 and even as high as $20 per day; that cement finishers were paid as high as $15 per day; that carpenters frequently received bonuses of from $2 to $3 per day, that all labor was scarce, difficult to obtain and very naturally not working at full efficiency under such conditions. We know that it is now possible to obtain practically all laborers and skilled mechanics, especially in reinforced-concrete construction, at the established union rates, and that, moreover, the men are anxious and willing to work efficiently and skillfully and have interest in holding their positions.

Smaller Margin of Profit

A still more vital factor to be weighed is the selling psychology of the general contractor which always follows a definite seasonal trend. In the spring and summer when work is plentiful, the general contractor and the special contractor will invariably place upon his work a considerably larger margin of profit and contingency, justifiably so against the sky-rocketing of summer costs. In the fall when work begins to become scarce and the contractor is confronted with the problem of holding his organization together during the winter months, he will invariably lower his percentage of profit and take work on a closer basis as to contingencies, appreciating that he will be able to manage, control and direct his work far more efficiently during the winter months than in the summer; and, consequently, can operate safely upon a closer margin than when he does not know from week to week, as during the summer months, whether mechanics' wages will increase two, four, six or eight dollars per day.

I have had our estimating department take from their files typical estimates and, using these various factors, the same building would have been estimated by us in August at $208,000 and today for winter construction at $203,000, showing a saving to the owner of at least $5,000 or 2½ per cent., this including all cost of winter protection. Therefore, under present labor and material conditions, it is certainly conservative to say that winter construction costs no more than summer work.

A.C.B. & C.I. Convention in Windsor on January 22 to 25

The Association of Canadian Building and Construction Industries will hald its sixth annual convention at the Prince Edward Hotel, Widnsor, Ont., on January 22nd to 25th next. All interested in the construction industry of Canada are invited to attend.

One of the principal features will be an exhibit of materials and apparatus, arrangements for which will be in charge of Harry Mero, of "Truscon" fame. Here, the manufacturing and supply members will exhibit the newest wrinkles in equipment and be prepared to explain the advantages of their special products.

The daily luncheons will be again a feature, and on the evening of the 22nd, it is proposed to hold an informal smoker. Among the speakers already secured are Dr. W. I. King, of the U. S. Bureau of Economics, a noted authority on Immigration and Wages, and Gordon Tamblyn, of Denver, Colorado, who will explain his system of estimating, an original and effective plan.

It is hoped to have a special evening devoted to an apprentice competition, to which the public will be invited.

Asphalt Roofing Manufacturers Amalgamate

Announcement was recently made of the merger of the Canadian Roofing Manufacturing Co., Ltd., of Windsor, Ont., with the Brantforl Roofing Co., Ltd., of Brantford. Part of the Canadian Roofing Company's plant was destroyed by fire in the early part of August. The balance of the equipment has been moved to Brantford, where all manufacturing will be centred, and the plant at Windsor will be closed. A warehouse, however, will be maintained in Windsor, to serve the trade in that section. The company will be known as the Brantford Roofing Co., Mr. C. S. Jackson, who was general manager of the Canadian Roofing Manufacturing Co., becomes sales manager of the new organization.

The Windsor company were very large manufacturers of asphalt roll roofings. The Brantford Roofing Company were also manufacturers of asphalt roll roofings, besides being the largest manufacturers of asphalt shingles. The combined businesses will form it is stated, the largest manufacturer of asphalt roofings in Canada.

The Company state that they are at the present time installing some very modern roofing machinery in Brantford, which will greatly lower the cost of production, and make their plant one of the most efficient on the American continent. Mr. Chas M. Thompson, manager of the Brantford Roofing Co., retains the same position in the new company.

Pawling and Harnischfeger Appointment

The Pawling & Harnischfeger Company of Milwaukee, Wis., have recently appointed Mr. N. P. Farrar as their district manager with offices at 605 Stephen-Girard Bldg., Philadelphia, Pa., and 50 Church Street, New York City.

A Problem that Demands Solution

Why Boys Do Not Enter Building Trades

Partly the Lack of Continuous Employment and Partly the Unpleasant Working Conditions—Some Suggestions as to the Cure for a Troublesome Situation

Under the caption, "Why Boys Do Not Enter the Building Trades," the Building Age publishes a statement of the present shortage of men in these trades, with suggestions of how to make the trades more attractive. That young men prefer to go elsewhere seems certain from the results of a questionnaire sent out by this paper. Only one third of several hundred youths, otherwise promising candidates, would express any interest in going into building. The trouble, we are told, seems to be partly the lack of continuous employment and partly the unpleasant working conditions, which the writer admits are antiquated compared with those in other industrial occupations. Still, young men of the right sort are needed in the building industry, and how to attract them is a subject of considerable concern to contractors. The article reads in part.

Lack of Foresight

We must look the situation squarely in the face. The present shortage of capable building mechanics can be laid directly to the lack of foresight of builders and the older mechanics themselves. We have recently been living in an age where the mechanic was looked down upon—a sort of cog in the industrial wheel. Men were known by numbers instead of by name, working conditions were primitive, comparatively nothing was done to interest young men in the different trades until we were face to face with the present serious condition.

Young men have been educated away from the different building trades, other callings have been made attractive, so they have comparatively little trouble in filling their ranks.

As Mr. Horowitz, the head of one of our biggest construction companies, said—the methods in use today in building construction are still primitive—most contractors expect men to work under conditions that do not exist in the worst of so-called sweatshop factories.

Why do not more young men take to some building trades? The work is healthful, outdoor labor, where skill and nerve are often required; it is the sort of work that should appeal to red-blooded American young men of good physique. One can have thrills enough, and to see a structure grow under you is interesting work—one is creating something.

The pay is good. There are many callings that pay less and that are in many ways less attractive; some are more dangerous, yet they do not have the trouble the building trades have in getting men. What is the answer? Let some of the young men speak.

By personal interview and questionnaire, Building Age obtained the first-hand, frank expressions of several hundred American young men, not now employed in a building trade. These were men whose ages were principally between 20 and 26, the most desirable ages for building recruits. Note that word it sounds better than " apprentice," or just indefinite "No. 142," etc. Their average pay was $28.74 per week.

Now 33 per cent of these young men thought they would like to enter some one of the building trades. 58 per cent had no interest, and 9 per cent were doubtful.

Of the young men that thought about trying some of the building trades, certain preferences were made as follows:

Bricklayers	25%
Electricians	21%
Carpenters	20%
Tile-layers	11%
Plumbers	8%
Painters	5%
Plasterers	5%
Ironworkers	3%
Stone-cutters	2%
	100%

Perhaps, in another crowd of young men, the percentages would vary, but here is what was in the minds of a representative "bunch." The amount of pay is not the only thing that appeals—plastering looks a little unpopular, despite being one of the highest paid jobs.

Now comes the subject of preferring a 'white-collar' job. These questions were asked of men principally in that sort of job, and yet only 25 per cent of them said that they objected to going to or from work in dirty clothes!

Some of the Reasons

And there we were thinking that our young men were looking down on any sort of a job where they could not be all dressed up. The reasons must be somewhere else. Here are some of the drawbacks that 143 had for not entering some building trade:

29 said no advancement seemed probable.
23 did not like the men they would associate with.
21 had no interest in building.
17 were not mechanically inclined.
16 objected because the work was too dirty.
14 families objected to their working at a trade.
12 would rather do office work.
11 preferred to work inside.

The greatest drawback that these young men see in working at a building trade, however, is that the jobs are not steady enough and that outside of the bigger cities, it is not possible to find steady work the year round.

To our readers of what is the geatest objection to working at a building trade, many answers were given. Here are a few terse ones showing just how the young men are thinking:

After you once learn the main points of your trade, it gives no opportunity for developing your mind further.

Unions ruled by wrong men and in hands of radical element.

Uncertainty of steady job and insufficient work the year round.

I would not work at a job where I had to belong to a union.

What brain-power is required to lay brick or spread plaster.

I prefer something better for a life work. I aim to climb, not to stay in one place with a set salary.

Laid off when job is finished. Work only lasts about eight months a year.

What Must Be Done

Here are some facts and we publish them for what they disclose. It seems essential that a 12-months year be established in the building trades.

It will take some careful planning of work to bring this about. Builders must also educate the public so they know in just what seasons a certain kind of work is or is not permissible for the best interests of all.

Young men should be encouraged to enter the building trades—no construction job should go up without at least one recruit at work in each trade.

Provide safe working conditions for the men—carrying compensation insurance won't stop the pain an injured workman suffers.

Provide a decent work-house with lockers where a fellow can keep his good clothes while he is on the job in comfortable work-clothes.

Let the locker-room be kept clean and provided with drinking water, wash-basins, soap, towels, and mirror. Don't forget to have a first-aid outfit.

Some of the primitive arrangements at certain building operations would disgust an aborigine; then why think that a twentieth-century American will submit, while in other occupations he works under better conditions!

It seems that builders have—unconscioously, however, driven the young men away from the building trades. Now the big job is to get them back. Sensible co-operation of contractors, workers and public will do wonders."

Letters to the Editor

Some Fallacies in Determining Cost of Hauling Western Coal

Toronto, December 12, 1923

Editor, Contract Record:

It is impossible for me to agree with the fundamental unit of train-mile cost upon which Mr. Butler has built up his calculation of $5.75 rate on coal from Alberta to Toronto. (Contract Record of Nov. 14, page 1073). The train-mile cost is such an unreliable element that it cannot be used with any degree of accuracy. It is too much of a hybrid to yield any scientifically pure results. It includes all trains in all directions—passenger, freight, mixed, branch line, main line, revenue and non-revenue, westbound empty trains as well as eastbound loaded trains. Such a composite figure applied to the movement of a single commodity in one direction could not furnish any adequate guidance as to the rate to be charged.

Moreover, the calculation which we have had placed before us does not take into account the westbound movement of empty cars, nor anything which should be charged for the maintenance of the equipment and the property. Nothing is added for terminal expenses nor for interest on the capital tied up in the rolling stock. No provision has been made for depreciation. Nothing in the way of fixed charges has been brought into the account and yet these constitute on the average ten to fifteen per cent of the total outlay of the Canadian railways. When it is remembered that, in 1922, for every loaded car moved 100 miles for the entire year's traffic an empty car was moved 45 miles; that in this coal movement the empty car movement would be practically 100% of the loaded movement and that the loaded car movement should pay the high expense of the empty car movement—with these considerations in mind it is manifest that the $5.75 rate per ton is very much too low. I should commend the system of computing this cost as established by the Canadian Pacific Railway and the Canadian National Railways as very murh more scientific, in fact, as close as we can get to the actual cost of transportation, and when the former reaches a figure of $9.95 and the latter $9.03 we can see how wide a disparity there is between the estimates of these two railways based upon actual experience and the figure based upon train-mile costs. A much more accurate basis of consumption, and to my mind the only proper basis, is the cost per loaded car mile, and against the loaded car movement—the revenue producing movement—there would have to be assessed the costs of transporting the empty cars westward.

Then, too, any theory on starting a solid train of any given number of cars from the mines of Alberta either at Lethbridge or Drumheller, to a destination in round numbers 2,000 miles distant is one upon which little reliance can be placed. Different gradients along the line alter the engine power.

Different classes of engine power have to be assigned to different sections. For instance a Canadian Pacific 210% engine would haul 3,100 equivalent gross tons from Lethbridge to Dunmore, but from Dunmore to Swift Current only 2,709 tons. A 155% engine would haul 2,116 tons from Moose Jaw to Broadview, but it would haul 2,685 tons from Brandon to Winnipeg and from Mac. Tier (Muskoka) to Toronto only 2,000 tons.

Reference has been made in the discussion upon this paper to the desirability of being freed from the coal supply of the United States and in order to be freed from this economic dependence upon Pennsylvania anthracite, it has been suggested in all seriousness that if it is necessary, in order to secure this result, the National Railways should be required to carry Alberta coal to eastern Canada at less than cost. I should view with alarm any such attempts to obtain the carriage of coal at less than cost, for several reasons. In the first place, if the National Railways put down the rate below cost the Canadian Pacific would have to follow suit and it is not difficult to see that this would mean disaster to the private company. In the second place, we are endeavoring to make lines under their control a paying system; but nothing would more seriously undermine the initiative and enthusiasm of the management in their efforts than to be compelled to carry traffic at less than cost. In the third place, if the Canadian National Railways had to carry this coal to eastern Canada at less than cost, the deficit would have to be made up from the Dominion taxes and it would be unjust to tax all parts of the country in order to provide a less-than-cost service to one particular part of the country.

Yours very truly,
(Prof.) W. T. Jackman
University of Toronto.

Claims that Bonding Companies Are Not Responsible for Worthless Contractors

Toronto, Dec. 8, 1923

Editor, Contract Record:

There have been several items of criticism in various journals recently, endeavoring to place the blame upon the bonding companies for the existence of many worthless contractors. It is quite natural, I suppose, to judge all the surety companies by the actions of two or three of the irresponsible companies, who turn up now and again, and will keep on turning up at intervals for all time to come. But is it quite fair to the companies of long experience who have been operating for many years, who do all in their power to keep the contracting business on a high level, that they should be held responsible for the actions of these fly-by-night companies?

Having been in the bonding business for over twenty years, I have some knowledge of the conditions in Canada and my answer is that if the contractors would establish themselves with a bonding company of some substance and not listen to every agent that comes around offering to cut his rate by five or ten cents, they would be helping to keep the contracting business where it should be. Would a contractor deem it wisdom to keep jumping from one bank to another, because one offered him loans at one half per cent less? Is it not usual and wise to establish yourself with a bank of some standing in the community, who would gain confidence in you from year to year, and accommodate you according to their knowledge of your ability, so that you would benefit in the end? A reliable bonding company will treat you properly and give you a line of credit and very often also give useful advice, and you will be better served in the end than if you place your confidence in some small company whose representatives call around at your back door offering to write your business a little cheaper if you do not tell anyone, and so on.

Such companies are not doing the contracting business a service and their doors are wide open to any and all contractors who might walk in. If the contractors will stop doing business with these firms and link themselves with one of the companies who understand the business and appreciate the liability they are assuming, the sooner such firms will be carrying on business on legitimate lines, or will be forced out of business, and then it will be impossible for undeserving contractors to obtain bonds.

There are dozens of bonding companies operating in America, companies who have the courage to say to a contractor, "You should not bid on this job, it is out of your line," or "You have a sufficient amount of work on hand according to your finances." These are the companies you should deal with; they make a fair charge for their services and the risk they undertake—a charge based on their experience of many years, and one which enables them to make a fair profit. Perhaps, therefore, the blame should not be placed on the bonding companies generally, but only on a few of them and the contractors themselves, and it is within the power of the reliable contractors to remedy this condition.

Remember, too, that the premium is indirectly paid by the owner and he is not objecting to the charges made, but he does object to the contractor putting in one rate in his tender and then shopping around for lower rates at his expense and offering inferior security, not only inferior from a financial standpoint, but the security of a company without experience in the contracting field and of one that has not gone to the expense of employing capable engineers to give advice when trouble arises. The possibility of any contractor being able to get a bond is apparent, but such bonds are only obtained from new companies in the field, companies who cannot obtain business by honest methods. Knowing that the other companies are charging the same rate to everyone whether rich or poor, they are in a position to play against honest competitors.

Stanley Moss
Manager, Fidelity Agency of
Canada, Ltd., Toronto.

Unfair Treatment of British Tenderers is Prejudicing Them Against Canada

Toronto, December 6, 1923.

Editor, Contract Record:

At a recent meeting of the executive council of the Canadian Association of British Manufacturers, the matter of the acceptance by public bodies of the lowest tenders for advertised contracts, was discussed. On several occasions recently, manufacturers of the Old Country who have bid for Canadian contracts, in response to public advertisements for tenders, have received little encouragement despite the fact that their prices were the lowest received and the quality indisputable. The following actual cases are noted below, the names of the public bodies and the firms tendering being omitted for obvious reasons:—

(a) An English firm tendered for goods required by a public body in the province of Quebec. Their tender was 20 per cent lower than a local bid. Much delay occurred in considering the tenders and finally facilities were given so that the local bid could be reduced by no less than 25 per cent. and the bid so reduced secured the order. The English firm's specifications were also partially used by the local firm to build the equipment required under the contract.

(b) An English firm tendered for goods required by a public body in the province of Ontario. Several of the highest tenders were rejected but one of them was allowed to remain in competition with the bid of the English firm, which was by far the lowest received. The decision was postponed from meeting to meeting and then given in favour of the English firm. After active work on behalf of the Canadian firm, the decision to award the contract to the English firm was actually reversed and the firm who had bid a much higher price was in effect allowed to revise their tender in order that they might secure the business.

This association has every proper sympathy with the desire of public bodies in Canada to award their contracts to Canadian firms but believes it is a sound business principle that public bids should be dealt with according to the spirit in which they were invited and that bids from manufacturers outside of the country should not be used in an unfair manner. This policy should satisfy not only suppliers but also purchasers.

The membership of this association, with branches in Toronto, Montreal and Winnipeg, represents many hundreds of United Kingdom manufacturers. The Canadian branch managers and agents of these firms have a vital interest in this matter, not only in their business capacity but also as taxpayers.

Among the reasons justifying the fair consideration of all bids received, the association would mention the following:—

(a) The taxpayers invariably benefit from the proper consideration of tenders.

(b) If the tenders of British firms do not receive fair treatment, they will be discouraged from tendering. Their views of the Canadian market as a buyer and of Canada as a field for British branch factories and warehouses, will naturally be affected unfavorably.

(c) The treatment of bids in an obviously unfair manner undoubtedly harms Canadian trade and credit at home and abroad.

(d) British firms expend considerable time and money in preparing their tenders in response to public invitations by Canadian municipal and other public bodies. They deposit their marked cheque, as an evidence of good faith, as is desired by those bodies, the cheque being frequently for a large sum and the money in the meantime being unavailable for their general business purposes. If a public body refuse to give them fair consideration, then prior announcement that British tenders are not desired, should be made. That would at least save British firms the unnecessary expenditure of considerable time, labor and money.

(e) The refusal to throw open public tenders and to treat bids in a fair manner, stifles competition and has the effect of enhancing prices to the detriment of the purchaser and of the public.

The subject of this letter is one which vitally interests the members of this association, many of whom are native Canadians. Many of them also are called upon from time to time to advise their principals in the United Kingdom in regard to such matters as the establishment of branch factories or warehouses in Canada, the purchase of raw materials here, the desirability of advertising their products in the Canadian press, and so on. Upon these and other matters, the treatment by public bodies in the Dominion, of the tenders received from British firms in response to public invitation, naturally has an important bearing.

Yours very truly,
G. T. WILSON,
President, Canadian Association
of British Manufacturers.

Concrete Tanks for Railway Service

While They Have Been Found Satisfactory for Water Supply Purposes, There Are Still Some Features that Need Development—No Fundamental Objections to Concrete

Concrete water tanks constructed on railroads to date have followed four general designs, so far as the tower, floor and walls are concerned. These designs are briefly as follows:

1.—The standpipe type of tank with the floor or bottom of the tank at or near the top of rail and utilizing the entire height of the structure for the storage of water.

2.—A cylindrical shell forming both the tower and walls of the tank with a diaphragm or floor placed at the desired height in the shell with a central pier or column to assist in supporting the floor. In some cases the central column has been eliminated, the floor being made self-supporting in the center.

3.—A cylindrical shell as above, forming both the tower and walls of the tank and a hemispherical bottom.

4.—A tower consisting of columns and a floor system of beams supporting a flat bottom and straight cylindrical walls.

Concrete water tanks now in service represent as many designs as there are tanks in service. Apparently in many cases almost as much attention is devoted to their appearance as to their utility. This is particularly true of tanks designed for municipal and other public water supplies. While the question of appearance has not been entirely ignored in the construction of concrete railway water tanks, with a few exceptions the concrete tanks in service are no more pleasing to the eye than the familiar steel or wooden water tanks, although the attractive appearance of the concrete tank is one of the principal arguments advanced in its favor.

Lack of Uniform Design is a Disadvantage

The lack of a uniform design of concrete water tank that would overcome the existing faults resulting in cracks in the concrete, seepage and other leakage has probably reacted against the concrete tank as much as anything else. A standard uniform design of tank would undoubtedly result in materially reducing the cost of construction and would bring this type of tank into closer competition with tanks of other types. The concrete tanks that have been erected represent nearly as many different designs as there are tanks, with the result that it is almost impossible to make a comparison of tanks under varying conditions of service, while an intelligent estimate of costs is practically out of the question.

Some designs have apparently overcome one fault only to develop another. Practice on different railroads varies widely as to design of tower and tank, thickness of floor and wall, reinforcing and method of placing, forms, mix, aggregate and method of construction and until some design of tank is developed and adopted that will be uniform, at least in general principles, progress will necessarily be slow.

In the development of a railroad property it is frequently necessary to move water tanks, and from the nature of their construction concrete tanks cannot be moved. Thus, the permanence of the concrete tank, while used as the principal argument in its favor, is at the same time one of the principal objections to its use in many cases, for while it is undoubtedly permanent in every sense of the word, there is always a question as to the permanence of the railroad, in location at least, and changes in road may take place that will result in the concrete tank becoming useless within a few years. Where a steel or wooden tank could be moved to a suitable location at considerably less than the cost of a new tank, the concrete tank is not only useless but will probably entail considerable expense for wrecking.

Frequent Change of Location

As an example of the changes that occur in the location of water tanks, a study of 540 tanks in service on a middle western railroad shows that the location of only 56 has remained unchanged in 25 years. While of course many of these have been renewed on account of age it has been advisable to change their location in frequent instances. This serves to emphasize the necessity for the careful selection of a site that will not be affected by future changes and improvements. Very few railroad water stations can be considered permanent because experience has shown that operating conditions are constantly changing, requiring frequent and unexpected changes in yards and tracks.

Therefore, the erection of a concrete tank is inadvisable unless the location is known to be permanent beyond the possibility of a doubt. Thus, in a great many cases where the territory traversed by the railroad is not fully developed or where the water stations and line of road are not firmly established a concrete tank cannot be considered as a serious competitor of steel and wooden tanks.

The difficulty of obtaining a permanent location for a tank that will not be affected by changes in road or structures is probably the most serious objection to the extensive use of concrete tanks on railroads.

Cost of Concrete Tanks

It is extremely difficult to obtain any cost data on concrete railway water tanks that are applicable to average conditions or that can be used as a basis for estimates or comparison with other types of tanks on account of the wide difference in designs and the limited number of tanks in service.

It is obvious that concrete tanks will cost more at the present time than steel or wooden tanks of the same capacity, not only on account of the materials involved and the amount of labor required for construction but also on account of the expensive form work which is in some cases specially designed for each job and adds very materially to the cost. The additional foundation required for a concrete tank is also a factor affecting the increased cost over tanks of other types, as the weight of the concrete tank exclusive of the water, is much greater than that of a steel or wooden tank. Factors affecting the cost of concrete tanks other than design are the thickness of wall and the character of concrete, such as mix, aggregate, etc. The amount of reinforcing required in the construction of a 100,000-gal. tank varies in different designs from 14,000 lb. to 26,000 lb.

From the best figures available the cost of a 100,000 gal. concrete tank erected prior to 1918 ranged from $5,000 to $7,500. In all probability these tanks would cost considerably more at the present time. Estimates received in 1920 from a contractor making a specialty of concrete tanks placed the cost of a 100,000 gal. tank of the cylindrical type with an over-all elevation of 62 ft. between $8,000 and $10,000. The cost of a 100,000 gal. steel tank varies from $5,000 to $5,500 and of a wooden tank of redwood or cypress from $4,000 to $4,500.

The cost of concrete tanks is undoubtedly a factor which has contributed in no small part to limiting their construction on railroads. The question of cost will continue to have its effect upon the construction of concrete tanks until uniform designs and methods of construction are developed to such an extent that the cost will be reduced to compare more favorably with tanks of other types.

Conclusions

It has been demonstrated conclusively that it is possible to produce concrete that is impervious to water, at least to the extent required in a railway water tank.

No inherent fault has developed in concrete that would make it unfit for the storage of water and there does not appear to be any reason why it should not prove satisfactory for this purpose if the tank is properly designed and constructed.

There are certain features in the construction of concrete tanks that will have to be given further consideration, however, before the concrete tank can be considered with tanks of other types, chief among which is the question of design. There is no uniformity in design in tanks that have been constructed, which has kept the cost of tanks at such a high point that they have not been considered seriously in comparison with steel and wooden tanks. It is not the thought that a standard design of tank should be adopted to fit all conditions, but certain principles of design will have to be agreed upon before the concrete tank will come into general use. Such a design should be aimed to bring the cost of the tank into competition with other types of tanks and provide against leakage, both through porosity or through shrinkage or expansion of the concrete, resulting in cracks.

The difficulty in establishing a location that will be permanent and that will fit in with the development of a railroad property is one of the principal obstacles to the adoption of concrete tanks and their construction will be limited to installations where the location is known to be permanent beyond a doubt.

The first cost is another serious handicap to this type of tank as the investment required does not compare favorably with that of other types of tanks in spite of their acknowledged permanence and low cost of maintenance.

While the concrete tank will no doubt in time find its place in railway water service, it has not yet been developed to the extent that it can be recommended for general use. This statement is not based upon any specific objection to concrete as a material for water tanks as no fundamental objection may be offered against its use for this purpose.—By C. R. Knowles, superintendent of water service, Illinois Central Railroad, before the American Railway Bridge and Building Association.

Largest Single-Arch Bridge

The largest single-arch reinforced concrete bridge in the world has been opened to traffic in France. It is the 450-foot span over the Seine at St. Pierre-de-Vauvray, just completed.

How Should Lime Plaster Be Applied?

Standard Specifications Covering Two and Three Coat Plaster on Wood and Metal Lath

(Continued from last issue)

Three-Coat Lime Plaster on Wood Lath or Metal Lath on Wood Furring

33. The mortar shall be a mixture of lime paste or putty prepared from properly slaked quicklime which has been allowed to age either neat or sanded for at least three (3) days, or hydrated lime, with sand, hair, etc., in the following proportions:

Proportions for Three-Coat Lime Plaster on Wood Lath

Scratch Coat	Brown Coat
Stiff lime putty	Stiff lime putty
Plastering sand	Plastering sand
Hair or fibre	Hair or fibre
1 part by volume	1 part by volume
2 parts by volume	3 parts by volume
1 bu. per cu. yd of sand	½ bu. per cu. yd. of sand

Finish Coat

For various finish coat proportions, see section 49.

34. Plastering shall be to seven-eighths (⅞) inch grounds.

35. (a) Apply a one quarter (¼) inch coat of mortar with sufficient pressure to make a good key at the back of the lath.

(b) As soon as this first coat has become firm, but not fully dry or hard, the entire surface shall be cross scratched diagonally. Scratching shall be deep enough to provide good bond for the following plaster coat, but not deep enough to injure the keys. When this coat is dry apply the second coat.

36. (a) Apply sufficient brown mortar to bring the plaster surface out to grounds. Rod, darby and float the entire surface to a true even plane.

(b) This coat shall be well worked. The surface shall be left sufficiently rough to provide good bond for the finish coat. When the second coat is dry, apply the finish coat.

37. For finish coat specifications, see section 49.

Three-Coat Gauged Lime Plaster on Metal Lath on Metal Furring

38. The lime putty, sand and hair in the following proportions shall be thoroughly mixed by machine if possible. If hydrated lime is used the materials may be mixed by hand if desired. Just prior to delivery to the plasterer the proper amount of gauging cement shall be added and well worked in. No more plaster shall be gauged with cement than can be applied within one and one-half (1½) hours after the cement is added.

Proportions for Three-Coat Gauged Lime Plaster On Metal Lath

Scratch Coat		Brown Coat	
Stiff lime putty	80%	Stiff lime putty	90%
Gauging cement	20%	Gauging cement	10%
Plastering sand		Plastering sand	
Hair or fibre		Hair or fibre	
1 part by volume		1 part by volume	
2 parts by volume		3 parts by volume	
1 bu. per cu. yd of sand		½ bu. per cu. yd. of sand	

Finish Coat

For various finish coat proportions, see section 49.

39. Plastering shall be to seven-eighths (⅞) inch grounds.

40. (a) Apply a one-quarter (¼) inch coat of mortar with sufficient pressure to make a good key at the back of the lath.

(b) As soon as this first coat has become firm, but not fully dry or hard, the entire surface shall be cross scratched diagonally. Scratching shall be deep enough to provide good bond for the following plaster coat, but not deep enough to injure the keys. When this coat is hard, apply the second coat.

41. (a) Apply sufficient brown mortar to bring the surface out to grounds. Rod, darby and float the entire surface to a true, even plane.

(b) This coat shall be well worked. The surface shall be sufficiently rough to provide good bond for the finish coat. When the second coat is dry, apply the finish coat.

42. For finish coat specifications, see section 49.

Gauged Lime Plaster for Solid Plaster Partitions

43. The lime putty, sand and hair in the following proportions shall be thoroughly mixed by machine if possible. If hydrated lime is used the materials may be mixed by hand if desired. Just prior to delivery to the plasterer the proper amount of gauging cement shall be added and well worked in. No more plaster shall be gauged with cement than can be applied within one and one half (1½) hours after the cement is added.

Proportions for Gauged Lime Plaster for Solid Plaster Partitions

Scratch Coat		Brown Coat	
Stiff lime putty	80%	Stiff lime putty	90%
Gauging cement	20%	Gauging cement	10%
Plastering sand		Plastering sand	
Hair or fibre		Hair or fibre	
1 part by volume		1 part by volume	
2 parts by volume		3 parts by volume	
1 bu. per cu. yd. of sand		½ bu. per cu. yd. of sand	

Finish Coat

For various finish coat proportions, see section 49.

Note. Type of partition desired should be specified by the architect in accordance with the directions of the manufacturer of the partition chosen.

44. Plastering shall be to seven-eighths (⅞) inch grounds.

45. (a) Apply a one quarter (¼) inch coat of mortar to the face of the metal lath with sufficient pressure to make a good key.

As soon as this first coat has become firm, but not fully dry or hard, the entire surface shall be cross scratched diagonally. Scratching to be deep enough to provide good bond for the following plaster coat, but not deep enough to injure the keys.

46. When the scratch coat (which is applied to only one face of the wall) is hard, apply the second coat.

47. (a) Apply sufficient brown mortar to both faces of the partition to bring the surface out to grounds. Rod, darby and float the entire surface to a true, even plane.

(b) This coat shall be well worked. The surface shall be left sufficiently rough to provide good bond for the finish coat. When the second coat is dry, apply the finish coat.

(Continued on page 1214)

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Building Restrictions and Public Rights

Last week, after considerable juggling of decisions, the city council of Toronto finally refused to amend the building by-laws so as to permit the erection of a large and costly apartment house in a district of the city restricted to the building of private residences only. The incident is important, chiefly, as indicating to what extent political influences can dominate public bodies and set aside popular will. While it is true that in this case the final decision of the council vindicated the wishes of the people whose rights were in danger of being trespassed, there were times during the discussion when influences brought to bear on the council nearly brought victory to those who would circumvent the exercise of just rights.

Stripped of all its localism, the matter still has an important general significance. When persons buy property in a restricted district, they virtually pay something for that restriction, because if it were not imposed quite as high a price could not be commanded. They pay this higher price on the reasonable supposition that their investment will be amply protected and because of this guarantee of protection, the whole district assumes a high-class atmosphere, quite in accord with the intentions of those who were responsible in the first place for the restrictions. When these restrictions are removed, through action of a municipal council, without the consent of the property owners of the district, it is clearly a case of breaking faith, for which the property holders would in our opinion, be fully justified in demanding compensation.

In the particular incident referred to, the organization that proposed the erection of the apartment house, attempted to force through the council an amendment to the by-laws in the face of strenuous opposition from the citizens of the district. Desirable or handsome as the apartment may have been, the property owners were within their just rights when they insisted that their consent must be obtained before restrictions, for which they had really paid something, were removed. They argued quite logically that the erection of a type of building other than that for which the district was limited, injured the property and affected the investment made in it.

The city council did right in finally refusing to make any change in the by-laws. It is clearly a matter, because of their heavy interest in it, for the ratepayers of the district to determine. Circumstances may change in such a way as to make the removal of restrictions desirable. When that does happen, the property owners will be ready to accept an alteration in the character of their properties.

The Wrong Time to Patronize Home Industry

The Municipal Research Bureau, in a letter addressed to the mayor and city council of Toronto, directs attention to the serious injury that it considers is likely to result from the rejection of the lowest tender for the supply of cast iron water mains. It says many citizens and taxpayers learned with surprise and grave concern that the council failed to support the lowest tender system. The referring back of the matter to the board of control "to enable the latter if possible, to arrange for a price that would enable the work to be done in Toronto," in the opinion of the Bureau, was not only "unsound business practice, but a breach of ordinary ethical standards." It goes on to say that the advisability of restricting Toronto city contracts to Toronto firms is a matter of policy which may be open to discussion, but the desirability of the preservation of a deserved reputation for straighforward business conduct is not a matter for discussion.

The time to adopt the policy of patronizing home industries only was before tenders were called for. When that was not done and tenders were invited without limitation, the lowest tenderers had every right to expect fair and equitable treatment. In presenting its views on this matter the Bureau declared that whatever policy might be adopted in the future that in the present instance of supplying cast iron water pipe, honorable dealing demanded that the contract should be awarded to the lowest tenderer. By not doing so a blow was given the best interests of the city, which depends for its prosperity as a great distributing centre not only on the excellence of its wares and moderate prices, but on the good-will of those to whom it offered its products for sale and on their confidence in the good faith of Toronto and its citizens.

The Need of Winter Construction

By FRANKLIN D. ROOSEVELT

When winter comes, construction men know that spring is not far behind. Unfortunately through the years the idea became fixed that the winter season was disadvantageous to successful prosecution of construction projects. But winter construction has been done, can be done and should be done.

In the early days of the country's development, when time was less essential than it is today and when our industrial situation was less complicated, it was seemingly justifiable to defer building until climatic conditions made matters a little easier. In our present rapid age when our vast population consumes the limit of production in many lines, construction cannot afford to doze in the atmosphere of mid-Victorian non-aggressiveness.

There is the possibility of a volume of construction for 1924, if present indications are sound, equal to if not greater than for 1923. Realising this the American Construction Council recently urged all those interested in essential building projects in the near future to undertake such work at as early a date as possible in the fall or spring.

If winter is to bring a lull in meeting the demand for construction, next spring will find the construction industry confronted with problems of shortage in materials and labor, transportation difficulties, and a rising market that will seriously interfere with its progress. If that occurs the public will be forced to incur costly delays in getting needed improvements and run the risk of higher if not prohibitive prices.

The advantages of uninterrupted construction throughout the year must be apparent to everyone. Whether used as an ameliorative on transportation problems, or as an aid to continuity of employment, or as a necessity in stabilizing production of materials, or as an effective contribution to the public demand for construction projects, every day added to construction is of incalculable value.

Notable instances of major operations conducted during the fall and winter months during the past year or two with savings in construction costs ranging as high as ten per cent show the practicability of winter work and the benefits immediately accruing to individual owners and the public as well as to builders and labor on the job.

The country's need today is very acute. The construction industry must stand or fall in its obligation to the public as it meets that need or fails to meet it. It must have the help of those who contemplate building or other construction projects if it is to meet this need. Every day lost means an added accumulation to the growing demand.

The large volume of construction contracted for and already started during the fall months shows that the public has thus far responded favorably in undertaking winter work. But more winter work should be done. Let every prospective builder who contemplates necessary construction during the coming year go ahead now with the work.

The Week's Developments in a Nutshell

As the New Year approaches, strong objection to the new 6% sales tax is developing. One of the claims being pressed is that the pyramiding of this tax will increase the cost to the consumer unduly without any gain to the government coffers. For example, a manufactured article invoiced by the manufacturers at $100.00 will carry a $6.00 tax and cost the wholesaler $106.00. If the wholesaler adds 20% the cost to the retailer is $127.20; and if the retailer adds 50% the cost to the consumer is $190.80. Now, if the 6% tax had not been added to the manufacturer's invoice the cost of this same article would have been $120.00 to the retailer and $180.00 to the consumer. If we now add the government tax of $6.00, the final price to the consumer would be $186.00. We thus see that by the present method of collecting the tax the consumer will pay the difference between $190.80 and $186.00, i.e., $4.80 extra.

In other words the consumer pays $10.80 so that the government may receive revenue to the amount of $6.00.

The turnover tax which is now being widely advocated is open to the same objection of course, but since the tax rate would be very much lower, to yield the same total revenue, the total amount of the pyramid would be almost negligible by comparison.

The force of this argument on pyramiding can scarcely be over emphasized. An increase in the cost to the consumer reacts immediately and directly on general business. Not only does it reduce the consumer buying power but it reacts further by reducing turnover and thus further increasing cost of doing business all along the line. It looks as if the government had not sufficiently considered this phase of the tax problem.

With the approach of Christmas, retail trade is looking up but the holiday lines are profiting most. Fear is experienced in some quarters that the mild weather will have the effect of inducing people to spend their money on non-essentials and luxuries rather than on the more necessary and sensible gifts. Unemployment is not much in evidence, particularly in the construction field, and this of course will have a favorable effect on general holiday business.

The prospects all over Canada seem to be that we shall have the happiest Christmas in many years.

Hints for the Contractor

Gasoline Shovel Wades Down River to Site of Work

A very interesting stunt was recently pulled off with a 22-ton shovel by the Dells Paper & Pulp Company of Eau Claire, Wisconsin, on their new dam construction job. In order to speed up the excavation work so the foundations could be poured before freezing, they had purchased a Pawling & Harnischfeger 3/4 yd. gasoline shovel.

Their dam was at a point in the river where there was a high bluff on each side. They had originally figured that it would be necessary to dismantle the machine and skid the parts out onto a platform, from which it would have been lowered by derricks a distance of seventy or eighty feet and reassembled. This would have taken at least a week's time and much labor, besides the continued payment of wages to twenty or thirty shovelers whose work the machine was to do.

The manufacturer of the shovel, hearing of this condition, and desiring to be of service to the purchaser of the machine sent an engineer to look over the job. His report was that the machine could be run into the river about a quarter of a mile below the dam and moved under its own power to the coffer-dam. This seemed unbelievable to the owners, knowing as they did the treacherous condition of the river bottom, it being full of deep holes and ledges.

Unique way of getting a P. & H. shovel to the job

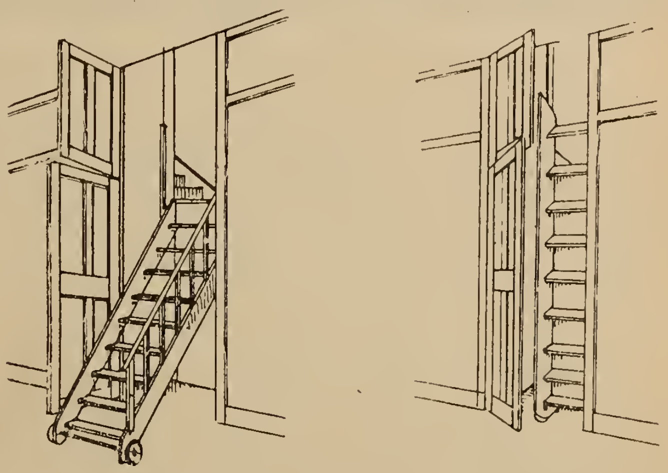
However, with the assurance of the builders they decided to take a chance. The machine was started into the river at eleven o'clock on Saturday with three men aboard, and began its journey.

Many times during the trip it looked very bad to the watchers on the bluffs. The machine ran over ledges and would rear up like a duck taking a dive. Other times it would run into holes which could not be avoided, and the water would almost reach the magneto and carburetor, the current getting swifter as the machine neared the dam.

After hours of negotiating through the swift black water, during which time the machine behaved perfectly, in spite of the hardship thrust upon it the coffer-dam was reached. Another hour to reinforce the planking and supports and the machine came up out of the water like a huge hippopotamus, crawled over the dam and down into the hole 12 feet below. It took just five and one-half hours for three men to do the trick.

An Economical Staircase

A London, Eng., architect has designed a staircase suitable for small houses where space is too valuable to be lost or is lacking for a proper staircase. The diagrams show how this has been attained, and the invention should be extremely useful as an escape stair to the roof as well as for mere stair purposes. It is being taken up by people interested in smaller houses.

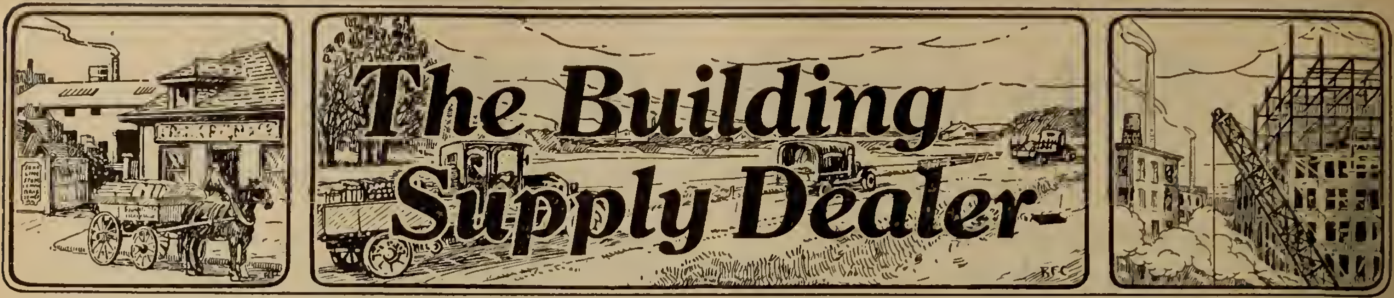


Repairing a Lift Span Bridge

The counterweight cables of the Halsted St. lift bridge in Chicago were renewed in 1922 after being in service 28 years. F. H. Avery, engineer of bridge maintenance, in the latest annual report of the city engineer makes the following reference to the work:

The cables were in good condition, except at the lower end where they were fastened to the top chord of the span. At this point they pass through a long clamp and around a pin. Upon removal, the portion passing around the pin was found to be in a dangerous condition with about one-half of the strands broken, the ends of these strands being corroded until they were as sharp as needles.

The work was done without interrupting traffic, the span being closed to river traffic for the time necessary to change two cables each on two diagonally opposite corners. This change at first took 10 days, but this time was reduced finally to 4 days. Sixteen cables were changed in all and work continued in zero weather, accompanied by high winds, which speaks well for the mechanics. This winter work was made possible by building shelters for the men at the tops of the towers. During the periods the span was closed to navigation, work was carried on continuously with two 12-hour shifts, which, of course, increased the cost (22,062,19) of the work.



From One Account to One Hundred and Fifty in Seven Months is Doolittle Russell's Record

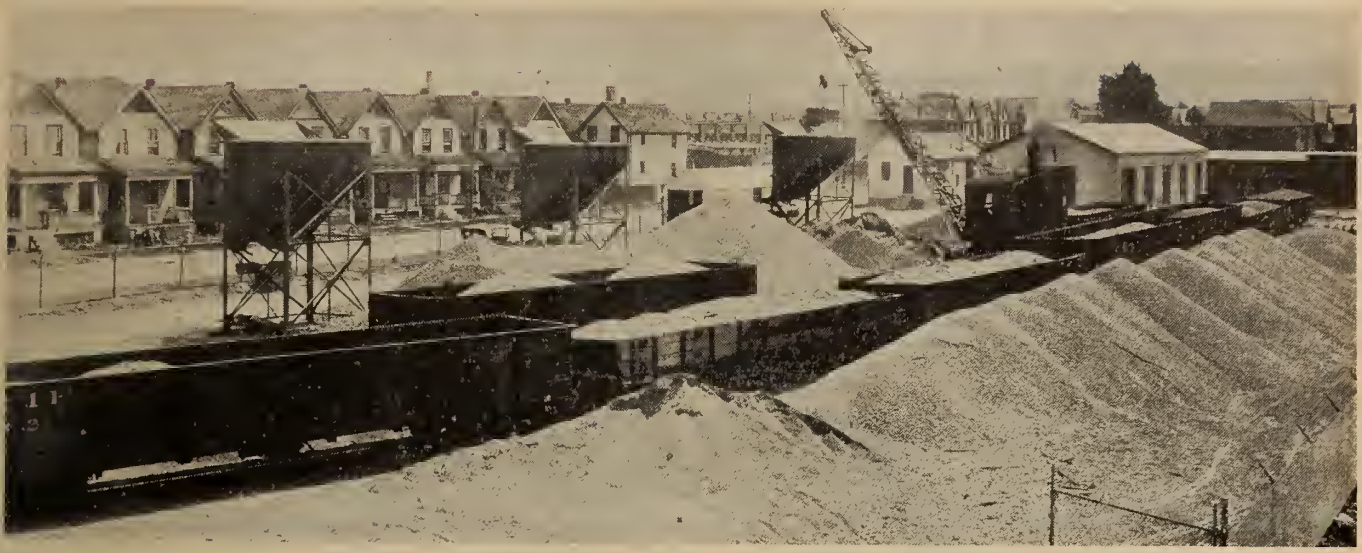
A Hamilton, Ont., Firm, Only Established in April, Already Handles 700 Tons of Materials a Day—Strict Attention to Contractors' Requirements Has Built up the Business

When a building supply firm in the first seven months of their existence can increase the number of their accounts from one to 150, handling during that time over 2,200 cars of materials and can attain a daily production on the average of 700 tons, their record is nothing short of phenomenal. Yet that is just what Doolittle Russell Ltd., of Gage Ave. North, Hamilton, Ont., have done since they were established on April 1 last. Starting out with no yard and only one order from the civic works department, they have succeeded in a comparatively short time in developing a remarkably voluminous business and in establishing a yard and plant that, for appearance, layout and efficiency, is unsurpassed, it is believed, by any other building supply yard in Canada. This has been accomplished by a clear recognition at the start of the type of service that contractors require and by an earnest attempt to meet these requirements as completely and in as efficient a manner as possible.

That the business was established in the first place was due to the foresight of two gentlemen well known for their long connection with the construction industry in one capacity or another—C. M. Doolittle, president of the Canada Crushed Stone Corporation, Ltd., of Dundas, Ont., and John E. Russell, president of the John E. Russell Co. Ltd. and the Russell Construction Co. Ltd., of Toronto, Ont. Both of these men, appreciating Hamilton's industrial importance and the consequent construction development that should continue to take place there, felt that there was need in that city of nearly 150,000 people for a thoroughly up-to-date builders' supply yard that could guarantee a service par excellence. With this thought in mind, then, they initiated the venture, putting into it the results of the long experi-

Mr. Geo. A. McHaffie, the manager of Doolittle Russell Ltd.

Business has grown to such an extent as to force enlargement of this office. A neat fence, a trim lawn and well kept flowers make the plant an asset to the neighborhood



The yard of Doolittle Russell Ltd., is arranged for the speediest possible handling of materials. Steel bins are the latest word in permanent equipment

ence which both Mr. Doolittle and Mr. Russell had acquired from their respective connections with the construction industry. So, about the first of April last, the firm of Doolittle Russell Ltd. took shape and, as intimated previously, with one order from a civic department, commenced active business. With no loss of time, the company laid out a yard and established an office and in this way firmly entrenched themselves as an important element of the industrial life of Hamilton. Thus, throughout the busy building season, Doolittle Russell Ltd. were prepared to supply and did supply all the needs of the contractors of the city, with a promptness that met with high favor.

A substantial Frost wire fence adds to the appearance of the yard and protects it against intruders

Volume of Business Has Necessitated Expansion

It is worthy of comment that, unlike so many new concerns, Doolittle Russell Ltd. did not venture into the building supply business in a small way and expand only as the growth of business warranted. A policy of that sort generally leads to the development of those scraggly, unattractive, patched-up supply yards that are characteristic of so many of our towns today. Rather did Doolittle Russell Ltd. undertake to establish right at the start the very best their resources could command, confident that business would come when the facilities were there. The experience of the past eight months has served to justify that policy and today the firm are confronted with the necessity of enlarging their office in order that they may maintain, as they desire to do, their facilities always a little in advance of current requirements. Doubtless, this policy has contributed very substantially to the very remarkable growth of business that has developed since the firm's inception.

Reference has been made more than once to the unusually excellent facilities which Doolittle Russell Ltd. have established and in two of the illustrations an attempt is made to picture them, although the photographs hardly do justice to the yard. It will be noticed, however, that the whole plant has an extremely clean-cut appearance with order and neatness permeating everywhere. In the first place, the firm were solicitous of the feelings of the residents of the neighborhood, who might have objected to the establishment of a building supply yard in their vicinity. Consequently, a very neat Frost wire fence, of substantial build, was erected around the site and the lawn fronting on Gage Ave. was sodded and plant-with a large number of young trees. Attractive flower beds in front of the office, as well as flower boxes on the window sills, add an atmosphere of beauty, while the substantial character of the buildings, bins and other appurtenances make the yard a credit to any neighborhood. Having thus gone to a great deal of trouble to make the whole site attractive, the firm are protecting this part of their investment and ensuring continued attractiveness by keeping one man wholly engaged in looking after the external appearance of the yard—watering and trimming the lawn and flowers, removing debris, cleaning the driveways and similar duties. There is no question that, quite aside from the sense of pride which a policy of this sort engenders, a certain amount of business comes as a direct result of the well-ordered and methodical nature of the yard. Who, if confronted with the choice of doing business with a firm notorious for the run-down character of their yard and one with whom neatness and order predominated, would not choose the latter, all other things being equal?

Substantial Buildings and Equipment

The visitor to the yard is struck with the substantial character of the buildings and equipment. The office itself is a handsome one-storey structure of white stucco over interlocking tile, the basement being of cement block. Back of it is the cement shed in which are stored cement, hydrated lime and other neat products. It is a building of heavy timber framing, sheathed with corrugated iron and provided with numerous sliding doors. The floor is at the height of the average truck or wagon platform, thus facilitating the transfer of materials from warehouse to truck. A siding adjoins the back of the shed and permits direct unloading from the cars. To one side of the office is another corrugated iron building which serves as a garage. No extended accommodation is provided, however, for housing delivery equipment, since it is a policy of the firm to hire their transport service.

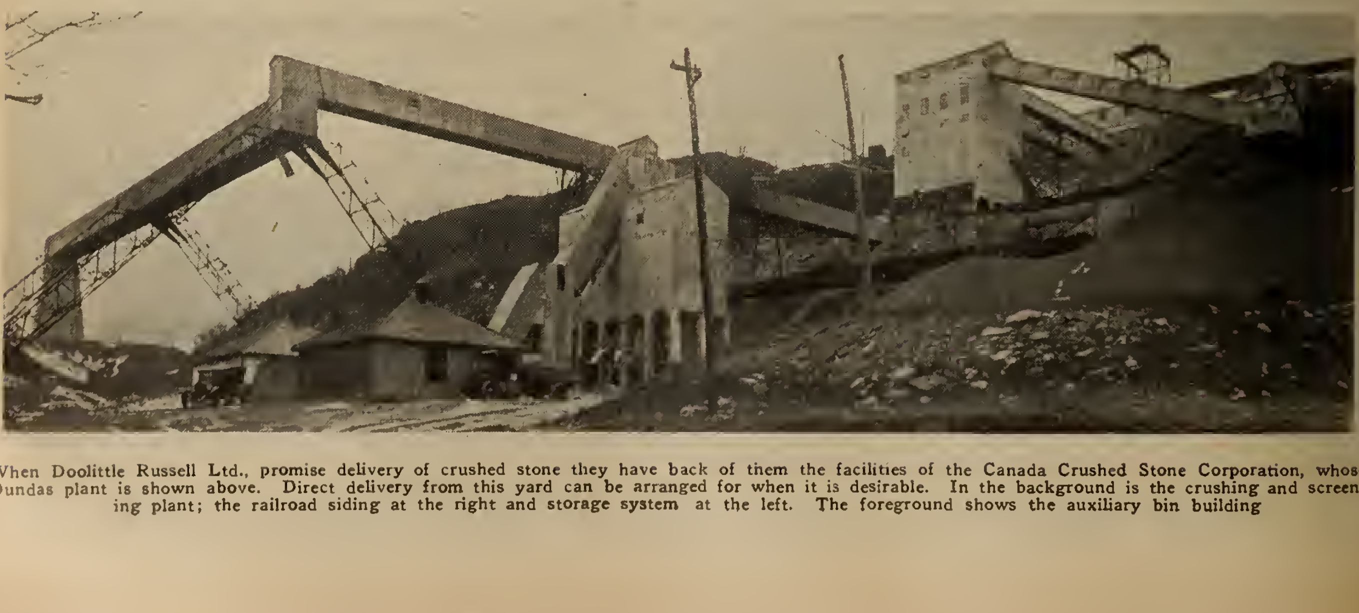
An "Industrial" crane has proved its worth many times over in the expeditious handling of materials

The yard itself is provided with sidings from the Canadian National Railways and the Toronto, Hamilton and Buffalo Railway (C.P.R.) Bulk supplies—sand, stone, etc.— are unloaded from the car either into stock piles or directly into bins by means of an "Industrial" locomotive crane, mounted on railway trucks, and which is used also for spotting and shunting cars. A stiff-leg derrick also assists in unloading cars. Four large-capacity steel bins, built by the Hamilton Bridge Works Co. Ltd., to Doolittle Russell's own specifications, provide, respectively, for 2 in. crushed stone, 1 in. crushed stone, ½ in. stone screenings and concrete sand. Each bin is fitted with two spouts, closed with counterweighted gates. Another excellent piece of equipment with which the yard is fitted is a "Batcher" plant for sand, made by the Blaw-Knox Co., Pittsburgh, Pa. This is a steel, one-compartment bin, which measures out accurately two one-cubic-yard batches. The yard is also equipped with a sand screener of special design.

The layout of the yard is such that the delivery trucks enter at the far end and, with no lost motion, pass all the bins in turn, finally being checked out at a weigh scale beside the office. In having to pass the office in this way, no outgoing load can leave without being checked by the office staff. While the yard is conveniently located to serve most of the city of Hamilton, it has been found economical to take care of orders from the west end of the city directly from Dundas, Ont., where the quarries of the Canada Crushed Stone Corp. are located, from which source of supply Doolittle Russell obtain their stone.

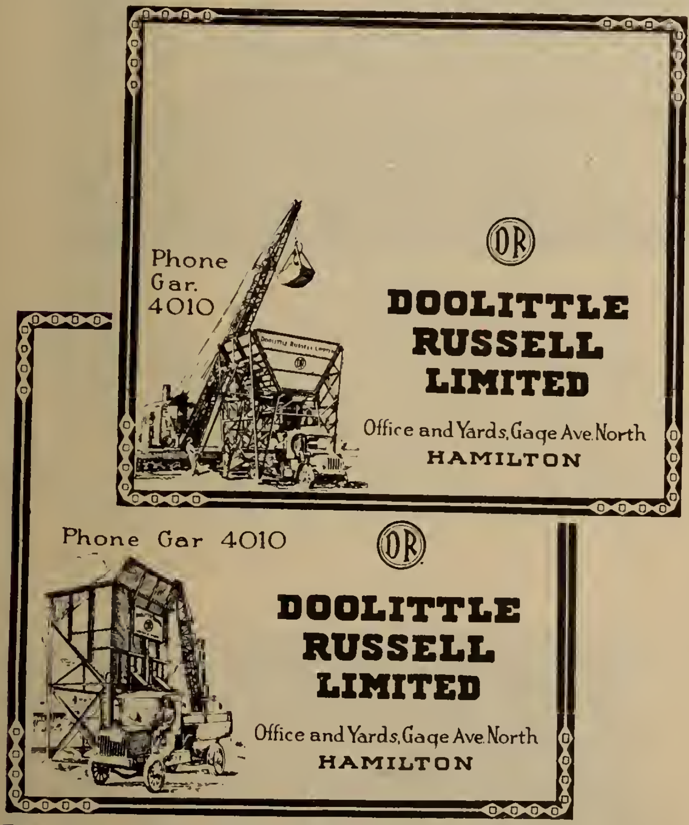
Delivery Performed Under Contract

As intimated previously, Doolittle Russell Ltd. do not possess their own delivery equipment, but hire trucks and teams under a contract, as many as 18 trucks a day being sometimes employed. The compensation is based on a rate per mile which varies according to districts and their distance from the yard. In contracting for their transport, instead of handling their own, Doolittle Russell Ltd. believe that they are solving their problem in the most econ-



When Doolittle Russell Ltd., promise delivery of crushed stone they have back of them the facilities of the Canada Crushed Stone Corporation, whose Dundas plant is shown above. Direct delivery from this yard can be arranged for when it is desirable. In the background is the crushing and screening plant; the railroad siding at the right and storage system at the left. The foreground shows the auxiliary bin building omical way, for the reason that, in their opinion, firms who make an exclusive speciality of haulage can operate much more efficiently than those with whom transport is just an incidential in connection with other business.

At the beginning of the article, reference was made to the wonderful growth of business which the Doolittle Russell firm has experienced. Evidence of this is provided by the fact that the company are now planning to enlarge their office quarters by the addition of another storey, the present accommodation having been absolutely outgrown. While the initial office staff was one stenographer in addition to Mr. McHaffie, the manager, it now numbers two office assistants and three bookkeepers. In fact, the accounting department has become so large that Mr. McHaffie had to give up his private office in order to provide the bookkeepers with adequate office space. The reason for this expansion in office staff will be understood when some figures are quoted. Up to the time of writing, which represents 7½ months of business, there had been shipped from the yard 826 cars of stone, 1,256 cars of sand, 108 cars of cement and 85 cars of other supplies. The average daily output is now 700 tons of materials, while a peak output of 1,000 tons has been attained. A big business is also being built up in McCracken concrete sewer pipe, manufactured by the Independent Concrete Pipe Co., Woodstock, Ont., for which firm Doolittle Russell Ltd. have been appointed sales agents. Just recently the city council of Hamilton approved of the use of this pipe for civic work.


Phone Gar. 4010

DR

DOOLITTLE RUSSELL LIMITED

Office and Yards, Gage Ave. North
HAMILTON

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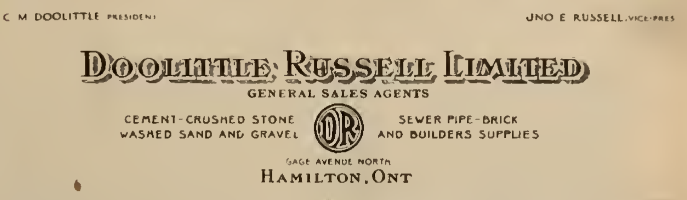
Office and Yards, Gage Ave. North
HAMILTON

Two typical advertisement layouts used in local newspapers. Suitable copy appears in the white space

The Secret of Their Success

What, one may well ask, accounts for this stupendous development in so short a time? This, one of the editors of the Contract Record endeavored to learn by conversation with members of the Doolittle Russell staff and he believes he discovered the secret. To his mind, what is building up this business is the close, intimate relationship which the firm develop to the jobs in hand and the strong, personal acquaintanceship which the staff enjoy with the foremen, superintendents and contractors of the city. The importance of this latter point was strongly emphasized by Mr. McHaffie himself. "The secret of our success," he said, "has been our thorough knowledge of and acquaintance with the men who are, or who may be, our customers. We endeavor to be on close terms with all the contractors and their purchasing agents and superintendents and with all the civic foremen. We familiarize them with our firm's name and the service which we can render. It pays immensely to be intimate with the people who may sometime be our clients.


C M DOOLITTLE PRESIDENT
JNO E RUSSELL VICE-PRES

DOOLITTLE RUSSELL LIMITED
GENERAL SALES AGENTS

CEMENT-CRUSHED STONE
WASHED SAND AND GRAVEL

DR

SEWER PIPE-BRICK
AND BUILDERS SUPPLIES

GAGE AVENUE NORTH
HAMILTON, ONT

The lettterhead employs the DR symbol, which the firm are seeking to popularize

Of course, while this personal contact may bring in business, it can never retain it unless there is some real service back of the relationship. This fact is fully recognized by Doolittle Russell Ltd. and for that reason they lay special stress on the need of keeping in immediate touch with every job for which they are supplying materials. They do not get the contract and let it go at that. They become, rather, part and parcel of the job, and through their acquaintance with the contractor and his staff, seek to co-operate in every possible manner, so that the utmost satisfaction and service will result. Take the Lister Building, Hamilton, as an example. This splendid seven storey, concrete office building, erected by the Pigott-Healy Construction Co., was constructed in remarkably rapid time, only 37½ working days being required, in fact, to pour the whole frame. For Doolittle Russell Ltd., however, the problem was more than just keeping the contractor furnished with enough materials to enable him to keep up his progress. It was complicated by the fact that, because of the location of the building, no storage space was available for a surplus of materials, with the result that enough supplies had to be laid in during the night to keep the job going the next day. This meant that Doolittle Russell Ltd. had to give a 24-hour service for seven weeks—a service they gladly rendered in order to satisfactorily meet the requirements of their client. The general contractors have expressed themselves as being indebted largely to this co-operation for the speed record they accomplished. That Doolittle Russell Ltd. were able to meet these exacting requirements was due to a considerable degree to the large capacity of their yard, the bins being capable of holding enough to give night service with the necessity of having only one man at work in the yard.

"We'll Keep Your Job Going"

The above incident is just typical of the service which the company tries to render consistently. "We'll keep your job going" is the Doolittle Russell slogan and it is to the credit of the firm that they make an earnest attempt to live up to the motto. As

Mr. McHaffie states: "The experience of the first few months in business has confirmed us in the policy of being prepared to supply everything the contractor needs promptly. To get business, however, we cannot sit behind our mahogany desks. We must get out and develop that personal touch that means so much in business relationship." Perhaps that is why Mr. McHaffie has already travelled in his car over 8,000 miles around Hamilton, in the past 7½ months, just developing that personal touch that he speaks of.

Systematic yard arrangement ensures that no confusion takes place and that prompt delivery will result

The Doolittle Russell firm are strong believers in advertising as a means of creating business and goodwill and in the local newspapers, they are constantly spending a reasonable amount of money for publicity purposes. Another form of publicity which is being developed is the use of signs on the jobs handled by them. A characteristic feature of these signs is the use of the letters D R in a circle, as emblematic ot Doolittle Russell service. This D R badge is being used in every possible place, including letterheads, so as to get it firmly established in the minds of customers and prospective customers.

With regard to competition, Mr. McHaffie states that while there has been considerable of it, it has been fair and square and prices have not been cut in an effort to get business that could not be obtained by any other method.

Doolittle Russell Ltd. have been handling a large amount of civic work during the past season and on this the same excellent service has been given as to private contractors. The personal contact between the staff of the company and the civic officials has helped considerably in developing and maintaining this class of business. Private work has included, besides the Lister building, the new East End collegiate, the Westinghouse factory, both constructed by the W. H. Yates Construction Co., and the Semet-Solvay coke plant, built by Semet-Solvay Co., of Syracuse, N.Y., as well as numerous smaller buildings and residences.

Developing a Cost System

The Doolittle Russell company are constantly seeking to improve their methods of conducting business and to this end, they are now engaged in developing a cost system which will give them an accurate knowledge of the cost of handling various commodities and provide a basis for estimating and tendering.

There is another matter which undoubtedly helps business of any kind and no less the building supply bhsiness, and that is, the development of the goodwill of the staff and employees. Doolittle Russell Ltd. have succeeded in obtaining this in no small measure, with the result that splendid harmony prevails between all the members of the organization and

An order of McCracken concrete sewer pipe received by Doolittle Russell Ltd.

each person on the staff is a strong booster for the firm and its principles. Just as an indication of the regard the company have for their employees, reference may be made to the establishment of a lunch room for the drivers in the basement of the office building, which is a service that the employees have appreciated very much.

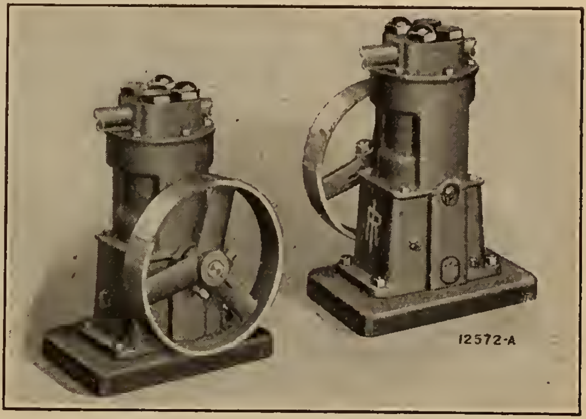
From this resume of the activities of Doolittle Russell Ltd., it will be evident that, judging from results, they have found the right way of doing business. Other building supply dealers can well profit from their experience and many old-established firms can afford to follow the lead of this company, which, while young in point of years, have appreciated what builds up real success. Their achievements have been due in large part to the enthusiasm of the manager, Mr. McHaffie, and the co-operation of his staff. During the war, Mr. McHaffie was in charge of transport work in the British Army in Russia and has put to profitable use in the supply business, the experience gained in the army. Credit must be given also to the personal interest taken in the firm's activities by the president, Mr. Doolittle and by Mr. Leonard Wookey, manager of the John E. Russell Co., of Toronto. Both of these gentlemen gave up much of their time solving the difficult problems that arose during the first few months of the company's history. Through the efforts of all of those named, as well as the co-operation of staff, customers and the railways, the difficulties incident to a new company have been overcome and the firm go forward into 1924 with even greater vigor and ambition.

A "Batcherplant" is one of the special facilities of the Doolittle Russell yard

New Line of Vertical Belt-Driven Vacuum Pumps

A new line of small vertical belt-driven vacuum pumps has been brought out by the Canadian Ingersoll-Rand Co., Limited, 260 St. James Street, Montreal, Canada. This line of pumps known as type 15, will pull and maintain vacuums between 28.6 in. and 29.25 in. depending on their size. In addition to the standard belt design each size is built as a self-contained electric motor outfit, using the short belt drive arrangement or driven through pinion and internal gear. The vacuum pump and electric motor of both the short belt and gear driven units are mounted on a metal sub-base, so that they are not dependent on the foundation for correct alignment.

The "constant-level" system of lubrication used on the type 15 vacuum pumps maintains a constant-level of oil, which insures the right amount being distributed to all parts. Like in the ordinary splash system, the bottom of the pump base forms an oil reservoir, of sufficient capacity, for the "constant-level" system. The amount of oil in this reservoir is determined by high and low level pet cocks. Above the reservoir and directly underneath the connecting rod is a constant level pan, into which the connecting rod dips and distributes just a sufficient quantity of oil for proper lubrication. The constant level pan is replenished with oil from the supply in the crank case by a valveless oil pump operated by an eccentric on the main shaft. Regardless of the amount of oil in the reservoir so long as it is somewhere between the high and low level pet cocks, it is stated this system will function perfectly.



There are six sizes—the 4 in. x 2 in.; 5 in. x 3 in.; 6 in. x 4 in. and 8 in. x 5 in. single acting pumps; and 10 in. x 5 in. and 12 in. x 6 in. double acting pumps. The 2 in., 3 in., 4 in. and 5 in. stroke single acting pumps are air cooled by means of an annular ring which encircles the cylinder, while the 5 in. and 6 in. stroke double acting pumps are cooled by means of circulating water. The type 15 vacuum pumps meet the requirements of chemical plants, food product factories, etc., where machines of smaller capacity than the regular straight line and duplex type are desired. Further details of these machines are given in a new bulletin, No. 3043-C, recently issued by the company.

Twenty-First Annual Meeting of Portland Cement Association

The twenty first annual meeting of the Portland Cement Association was held at The Biltmore, New York on November 19 to 21 inclusive. As usual, the first day's session was devoted to meetings of standing committees covering such subjects as accident prevention and insurance, advertising and publicity, conservation, technical problems, etc., resulting in the preparation of annual reports which were presented at the business session on Wednesday, November 21. On Tuesday, also following several years' custom, the general session was devoted to a discussion of problems concerning mill practice or things related thereto.

The annual election of officers was held on Wednesday, November 21, with the following results: F. W. Kelley, Albany, N. Y., was elected president, Blaine S. Smith, Chicago, first vice-president, and L. R. Burch, New York, second vice-president, all of these constituting re-elected officers. John W. Boardman, Detroit, was elected treasurer.

As most of our readers know, the Portland Cement Association has been carrying on for the past two years or more an educational advertising campaign, particularly directed toward acquainting the public with a better understanding of some of the problems of cement manufacture. As is too often true in connection with sizable industries, the common public loses sight of its inter-relation with, and interdependence upon any and all industry. It was the consensus of opinion, expressed at the meeting, that this campaign has produced most gratifying results and has justified a continuance.

Board-Foot Standard of Lumber Measurement

In the early days of lumber manufacture practically all lumber cut into boards or planks was sold on surface measure. A surface area of one square foot was consdiered one board foot, regardless of the thickness. Timbers, however, were sold on cubic measure. A need then arose to measure logs in terms of lumber measure. Thus it was necessary to adopt a standard thickness for the board foot, and gradually it became the practice to consider 1 inch as that standard for thickness. Lumber thicker than 1 inch was measured as the product of its surface area in square feet by the thickness in inches, while lumber thinner than 1 inch remained on surface measure. This board-foot unit was applied to lumber in the rough. Dressed lumber was always considered as of the same footage as the rough lumber used in its production.

Today very little yard lumber is sold in the rough, although the rough unit of measurement is used as the basis of computation and the rough or nominal size is used to designate individual items of lumber. Board-foot measurement is actual measurement when applied to rough green lumber only. In the same way, nominal sizes are actual only when applied to rough green lumber.

The board-foot standard is the most advantageous unit of measurement yet devised for use in computing lumber production and costs from the stump to its final use, in comparing prices of various products, and in compiling statistics of the lumber industry.—From "Standard Grading Specifications for Yard Lumber, as recommended by the U. S. Department of Agriculture."

Tenders for Watermains and Pipe in Edmonton

The following tenders were recently received by the city of Edmonton for watermains: R. A. Hulbert, 10013-83rd Ave., Edmonton, at $5,277.20 (accepted); C. L. De Wall at $5,459.60; Permanent Construction Co., at $8,041.80.

The following tenders were also received by the city of Edmonton for lead pipe: Mount Royal Metal Company, Montreal (accepted), $3,448.50; O'Hanlan Ferguson Co., Edmonton, $3,430.50; Revillon Wholesale, $3,611.98; Metals Ltd., Crane Ltd., James Robertson Co. of Winnipeg, Canada Metal Co. of Winnipeg, and Western Supplies, Eagle Smelting Co., Montreal, $3,762.00; Carrol Wilson, Ltd., $3,604.32.

New Power Plant at Tidewater, N.S.

The Nova Scotia Power Commission has recently signed a contract with the Albany Perforated Wrapping Paper Company of Albany, New York, to furnish that company at West River, Sheet Harbor, with 4600 h.p. of electric energy. The price for this power delivered at 2300 volts is about $21.30 per h.p. per year.

For the purpose of furnishing this power the commission will erect a second generating station on East River Sheet Harbor. This station will operate at a head of about 100' and will have an ultimate capacity of about 9000 h.p. It will be erected at Tidewater about four miles below the development at Malay Falls on the same river which the commission is just now completing.

Housing Shortage in the United States

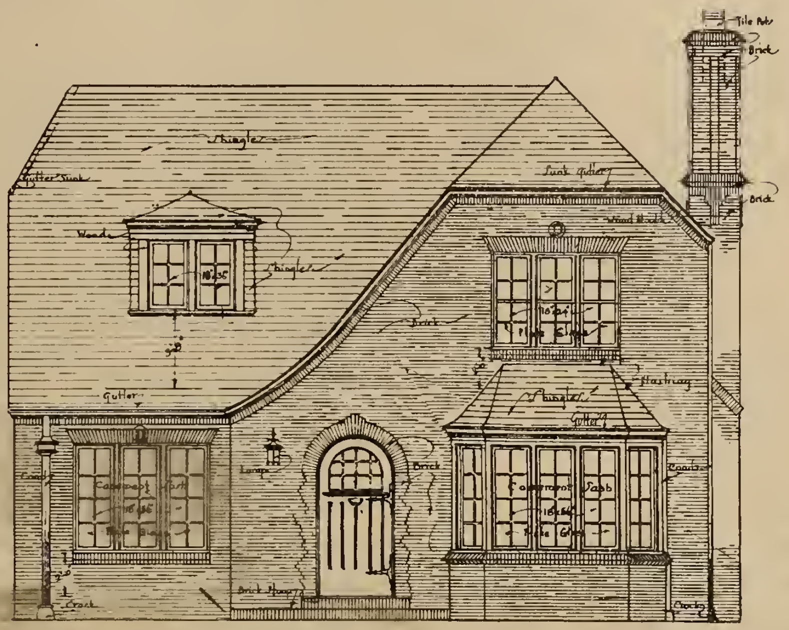
A shortage of between 800,000 and 1,000,000 houses in the United States was revealed by officials of the National Housing Association, who gathered to attend the three-day session of the ninth national conference on housing in America held at Philadelphia recently. Three vital factors in the blockade on housing were summed up as follows: High cost of money; high cost of material; high cost af labor.

England to Build Wider Roads and Streets

County roads and city streets to be laid out in Great Britain will have a right of way 120 feet wide in most instances and 100 feet wide as a minimum, if present plans of the government are carried out. Because motor traffic has made it obvious that the old narrow country roads are not in these days safe, public enthusiasm in England has greeted the official plan for the widening of existing roads and the establishment of the 120 foot width as the official standard for the future.

Long before the war the highways of England had become rivals of the railways through the use of motor trucks and steam traction engines, often hauling several trailers, each with a capacity of tons. The roads bore this traffic well and their splendid maintenance has enabled these highways to stand up under a much heavier traffic than 90 per cent of American roads receive.

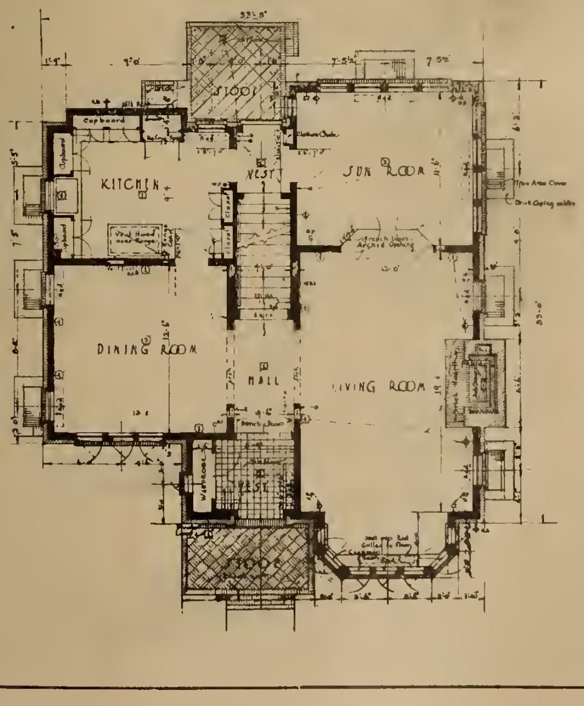
The Contract Record's
Weekly House Suggestion No. 93

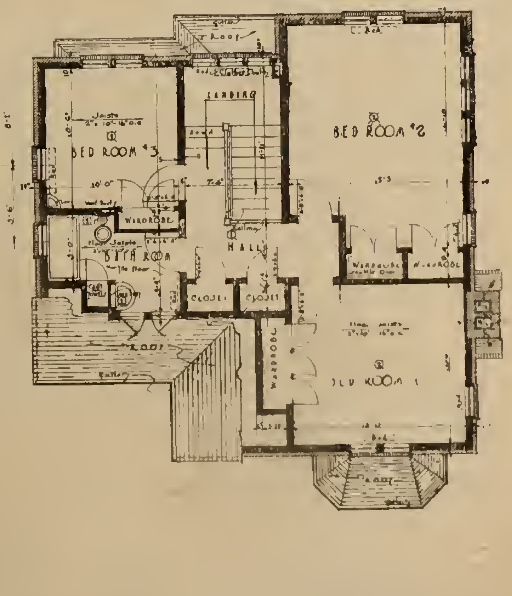


Distinctiveness of appearance is one of the principal features of this residence, designed by Mr. G. J. P. Jacques, architect, 3 Ouellette Ave., Windsor. Brick is effectively used in the base and trim of the handsome front entrance and on window trim, cornice, chimney, etc. Roofing is of wooden shingles, stained.

The centre hall plan of the first floor provides a beautiful large living room on the right, equipped with handsome hearth and connecting with sunroom at the rear through a wide arched doorway, fitted with French doors. The dining room and kitchen to the left are both large rooms and the latter, as seen on plan, is equipped with many built-in service features The plan reproduced requires very little explanation, it is so complete in descriptive detail. All the rooms are provided with plenty of natural light through many well-placed window openings.

Upstairs there are three bedrooms, all bright, good-sized rooms with wardrobe and closet space incorporated in each room. The flooring and trim throughout is of hardwood, with the exception of the bathroom, which is finished in tile.





How Should Lime Plaster be Applied?

(Continued from page 1202)

48. For finish coat specification, see section 49.

Finish Coat Specifications

49. (a) The white coat shall be applied evenly and trowelled to a hard and smooth finish. The finished surface shall be true to plane and free from all brush marks or other imperfections.

(b) The sand finish shall be applied in a thin even coat and trowelled, worked or rubbed to the desired even finish and texture. The finished surface shall be true to plane and free from all brush marks or other imperfections.

Proportions for Finish Coats on Lime Plaster

Hard White Coat	White Sand Finish
Stiff lime putty	Stiff lime putty
Plaster of paris	White sand
3 parts by volume	Plaster of paris
1 part by volume	3 parts by volume
	3 parts by volume
	1 part by volume

Brown Sand Finish

Stiff lime putty
Brown sand
Plaster of paris or
Portland cement
1 part by volume
3 to 4 parts by volume
As required (about 20%)

White Skim Coat

Lime putty only

50. Where quicklime is used for finishing it shall be thoroughly slaked in a watertight box and run through a No. 10 sieve (10 meshes per inch) and allowed to stand until cool before applying.

51. Where finishing hydrated lime is used it shall be made into a putty and allowed to stand over night before using.

Mainly Constructional

East and West—From Coast to Coast

Mr. I. W. McConnell, vice-president of the Dwight P. Robinson Co., of New York addressed the Montreal Branch of the Engineering Institute of Canada at a recent meeting, the subject of his address being the irrigation work carried out by his company in northeastern Brazil. Mr. McConnell's interesting talk was illustrated by a number of lantern slides.

At the recent civic elections at London, Ont., the city hall by-law was defeated by a vote of 4,566 against 2,834, and the Springbank dam by-law was also defeated by a large majority.

Construction of the new grain-carrying jetty near No. 1 elevator and the superstructure for the pier at Vancouver harbour will be commenced at once, contracts for the work having been awarded recently. The dredging contract goes to the Northwest Dredging Company and the substructure of the pier will be built by the Pacific Construction Company. The jetty will cost about $600,000.

At the special meeting of the township council, York township, Ont., recently a by-law was passed authorizing the entering into a financial agreement with the Toronto Transportation Commission for line extensions in the township at a total cost of $1,250,000. The street car line will be extended under this agreement from St. Clair Ave., up Oakwood Ave. to Rogers Rd., through Prospect Cemetery, and will connect ultimately with Davenport Rd.

The contract for the construction of two new bridges over the St. Charles River at Quebec were awarded a few days ago by the council of the municipality of Quebec West to T. E. Rousseau of this city. The bridges will be erected at a cost of $160,000. The bridges in question will be built, one on the site of the old Scott Bridge and the other on Marie l'Incarnation St.

By a majority of 179, municipal electors in the town of Pembroke, Ont., voted recently in favor of a money by-law to raise by way of loan the sum of $75,000 for the purpose of constructing a bridge over the Muskrat River at Mary St.

The province will contribute 40 per cent, or $17,600, towards the new bridge across the Speed River on King St., Preston, Ont., on which work is now under way. The Grand River Railway also bears part of the cost, as its tracks will be on the bridge.

A program of road building in British Columbia, which will involve the expenditure of about $20,000,000 during the next five years, was outlined in the legislature recently by Hon. W. H. Sutherland, minister of public works. Trunk roads will be extended and improved, and a network of lateral settlement roads will be built as feeders.

Toronto is to have another $100,000 theatre, at the corner of Woodbine and Danforth Avenues. Work has been already commenced and the theatre when completed will have a seating capacity of 1,200.

The city of Toronto is considering the erection of a permanent cenotaph on the city hall lawn, at an estimated cost of $25,000.

Considerable progress is reported on the revetment wall which the United Grain Growers' Limited is building on the lake front at its large elevator site at Current River, Port Arthur. Work is also to be started shortly on the elevator dock, which will extend for a distance of 550 feet along the newly dredged slip. This work is all preparatory to a commencement on the erection of consolidated terminal elevator facilities at Current River, which, when completed, will have a capacity of 7,000,000 bushels. Provided satisfactory arrangements can be made, it is understood that this work will be started next spring.

Contract for the construction of a new pumping station at Fort Erie, Ont., has been awarded to Messrs Fry & Co., of Toronto, at a figure of $18,596.

The Gay Company, of Oshawa, Ont, have secured the contract for the erection of an addition to the high school there at a figure of $194,450.

Trade Incorporations

Osborne Craft Homes Corporation, Ltd., with head office at Toronto, capital $40,000, to carry on the business of contractors and builders.

Obituary

Sir William MacKenzie died at his home at Toronto recently. Death was due to heart trouble.

Right Hon. Baron Shaughnessy, chairman of the Board of Directors of the Canadian Pacific Railway, died a few days ago at his residence in Montreal, after a very brief illness.

Mr. Thos. Neil Doody, Assistant Minister of Public Works, Ottawa, died a few days ago at San Raphael, Cal., where he had gone but recently to recover his health. Mr. Doody was born in Montreal in 1856 and entered the Canadian civil service in 1886.

CONSTRUCTIONAL ACTIVITY

Period of December 12 to December 18, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Digby, N. S.

The ratepayers of Digby recently passed a By-law for the purchase of an oil engine in connection with waterworks system. Town council is now in market for a 74 h.p. or 100 h.p. oil engine 1,000 gal. tank is to be purchased at once.

Ford, Ont.

Tenders are being received till December 27 by Essex Border Utilities Commission, Windsor, Ont., through the secretary, R. B. Baird, for the following contracts in connection with $250,000 filtration plant to be built: (a) construction of reinforced concrete filters etc.; (b) supplying 42 in. dia. steel pipe; (c) supplying cast iron pipe and specials; (d) supplying valves and sluice gates; (e) supplying rate controllers and operating tables. Engineer, J. Clark Keith, Essex, Ont.; consulting engineers, Gore, Nasmith & Storrie, Toronto. Plans and specifications with engineers. Marked cheque for 5% of tender resuired.

Guelph, Ont.

Work is in progress for the laying of sewers in several streets here.

Hamilton, Ont.

The city council contemplates laying asphalt pavement to cost $12,000, Kenilworth Ave. from Main St. to Barton St.

Work is to start shortly for the laying of cement sidewalk to cost $4,778, Kenilworth Ave. from Roxborough St., to Main St. west side. Engineer is W. L. McFaul.

Port Perry, Ont.

The town council contemplate laying 1 mile of bituminous bound macadam road, to cost $25,000. J. D. Kean, Whitby, Ont., is the engineer. Work to start in spring under supervision of road superintendent.

CONTRACTS AWARDED

North Bay, Ont.

Warren Bituminous Paving Co. of Ontario, Ltd., 54 University Ave., Toronto, has been awarded the general contract for pavements at $193,729. General contractor does all work. Underground work to start Jan. 2nd; paving to start May 1st.

Railroads, Bridges and Wharves

Railroads Bridges and Wharves

Canning, N. S.

Dominion Atlantic Rly., Kentville, N. S., contemplate the erection of a railway station here. This work will not go ahead before spring.

Ste. Germain Lac Etchemin, Que.

Tenders for the erection of an iron bridge here, are being received till January 1st by the town council, through the secretary, J. L. F. Chabot, Ste. Germain du Lac Etchemin, Que. Plans and specifications with Ivan E. Vallee, engineer, Parliament Bldgs., Quebec, Que., and the secreatry.

Tadoussac, Que.

Tenders are being received till January 8 by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Buildings, Ottawa, Ont., for extension to headblock of wharf. Plans and specifications at department offices of district engineers, Post Office Building, Quebec, Que., Shaughnessy Bldg., Montreal., Lower St. Lawrence Power Building, Rimouski, Que., and at post office, Tadoussac, Que. A 10% accepted cheque required.

CONTRACTS AWARDED

Cannes de Roches, Que.

Arthur Nadeau, Chardler, Que, has been awarded the general contract for breakwater extension at $5,169.

Niagara Falls, Ont.

General contract for 2 concrete arch bridges, $21,000, in Queen Victoria Park, has been awarded to R. H. H. Blackwell, Hamilton Trust building, Toronto.

Public Buildings, Churches and Schools

Acton, Ont.

The erection of a new library is contemplated by the Library Board. Estimates to be obtained for new building.

Ansonville, Ont.

Work is in progress on $10,000 town and fire hall. T. A. Massicotte, Ansonville, is supervisor of work.

Athens, Ont.

Tenders are being received till January 10, by Athens High School Board, through the secretary, Geo. E. Holmes, for $70,000 high school to be built here. Plans and specifications with architect, A. Stuart Allaster, King St., Brockville, Ont., and MacLean Building Reports, 345 Adelaide W., Toronto.

Cabano, Que.

Trimming interior is in progress on $100,000 church being built here for R. C. Parish. Architect, E. P. Raymond, 70 LaLiberte, Quebec, Que. General contractor, Geo. Dube, Cabano, Que. Heating trade to be let.

Edmonton, Alta.

Tenders for the construction of a foundation for grain elevator will be received till December 28 by the Dept. of Trade & Commerce, Ottawa, Ont., through the deputy minister, F. C. T. O'Hara. Plans and specifications with C. D. Howe Co, consulting engineers, Port Arthur, Ont., and Edmonton, Alta.

Halifax, N. S.

The city council contemplate an addition to city home on South St. By-law on this work will be submitted to ratepayers on January 1.

Montreal, Que.

J. E. De Patrick, architect, 381 Fourth Ave, Ros., has prepared plans for $300,000 college to be built near Mile End Road, for Italian Association. Tenders will be called by architect in March, 1924. Plans and specifications with architect.

Jos. Sawyer, 407 Guy Street, is preparing plans for completion of church on Amherst St., near Robin, owned by St. Catherines Parish. Tenders for this work will shortly be called.

Mimico, Ont.

Burden & Gouinlock, 101 King W., Toronto, are preparing plans of $100,000 high school to be built here.

St. John, N. B.

F. Neil Brodie, 42 Princess St., is preparing plans for $75,000 addition to school on St. James St, owned by R. C. Church.

St. Joseph, Que.

S. Rene Richer, 240 Girouard St., St. Hyacinthe, is preparing plans of school to be erected here, owned by R. C. School Board. Tenders for this work will be called early in February.

Sault Ste. Marie, Ont.

Plummer Memorial Hospital contemplate an addition to hospital to cost $75,000. Work is expected to go ahead in spring.

Toronto, Ont.

Bulk or separate tenders are being received till December 28 by the architect, E. J. Lennox, 364 Bay St, Toronto, in connection with alterations and addition to hospital buildings (maternity department) of Western Hospital. Plans and specifications with architect.

H. N. Dancy & Son, 22 College St., are submitting a tender in connection with addition to Toronto General Hospital, and want prices at once on subtrades, except masonry.

West St. John, N. B.

F. Neil Brodie, 42 Princess St., St. John, N. B., is preparing sketch plans of $100,000 church contemplated by the R. C. Parish.

Weedon, Que.

Tenders are being received till December 22, by the architect, J. W. Gregorie, 16 Wellington St., Sherbrooke, Que., on all trades, except heating, including fixtures, in connection with $100,000 church and rectory to be built here.

CONTRACTS AWARDED

Brockville, Ont.

Wm. Pattison, Prescott Rd., has the

contract for masonry in connection with $6,000 church being built here for Standard Church of America. All sub-trades to be let.

Caledonia, Ont.
The walls are going up for high school being built south bank of Grand River. Roofing contract has been let to W. A. Moffat, 86 Don Esplanade, Toronto. General contractors, W. W. Petley & Co., Toronto; architects, Walker & Gibson, 62 King St. E., Toronto.

Gore Bay, Ont.
Work is to start shortly on $10,000 court house to be built here. J. M. Nicholson, Great Northern Rd. has the contract for masonry. No other subs let. Ed Charters, general contractor, 139 Spring St., Sault Ste. Marie, Ont., wants prices on steel and cut stone.

Hamilton, Ont.
A. Schwenger, 18 Balmoral N., has the contract for electrical work, and Adam Clark, 7 Main St. W., the plumbing and heating contract on school being built on Murray St., W. General contractor, W. H. Cooper, Clyde Bldg; architects, Whitton & Walsh.

Haileybury, Ont.
F. R. Gibson has the contract for plumbing and heating of $15,000 rectory being built here for St. Pauls Parish church. Balance of work by general contractor, Joe Isherwood, Haileybury.

Montreal, Que.
Church Ross Co., Ltd., 10 Cathcart St., have been awarded the general contract for $500,000 hospital to be built on Pine Ave. and are receiving tenders on sub-trades. Montreal Unit Shriners are the owners. Associate architects, Hugh Vallance, 128 Bleury St., and J. M. Miller, 364 Dorchester St. W.

Jas. Ballantyne, 163 Nazareth St., has the contract for plumbing, heating and ventilating of city hall being built on Notre Dame St. Electric to be let Architect, Louis Perent, city hall.

Ottawa, Ont.
P. Lyall & Sons Construction Co., Ltd., Montreal, have been awarded the contract for addition to archives building at $294,797. Architect, R. C. Wright, Hunter Bldg., O'Connor St., Ottawa.

Oshawa, Ont.
Gay Co., Ltd., Oshawa, have been awarded the general contract for addition to College institute at $194,450. Tenders for mechanical trades will be called about January 4, 1924. Architects, Hutton & Souter, Bank of Hamilton Bldg., Hamilton.

St. Lambert, Que.
Dominion Bridge Co., Ltd., Lachine, Que., has the contract for structural steel for $100,000 building being erected here for town council, electrical dept. H. Gravel, 129 St. Denis St., is the general contractor. Engineer in charge is J. Kellett.

Business Buildings and Industrial Plants

Acton, Ont.
Acton Machine Co., is having plans prepared for $20,000 addition to their factory here.

Alfred, Ont.
Peat Fuels, Ltd., 230 Dorchester St. W., Montreal, contemplate rebuilding peat bog plant here. Will shortly be in the market for machinery and equipment.

Cartierville, Que.
Tenders are being received till January 2nd by the president, Mr. O'Connor, Cartier Jockey Club, 152 St. James St., Montreal, in connection with $76,000 grand stand and stables to be erected. Architect, A Shearer, 1225 St. Patrick St 50% guarantee bond required.

Eastview, Ont.
A. Sabourin, contemplates building a mineral water plant here.

Hamilton, Ont.
Dominion Sand & Gravel Ltd., Westdale, contemplate building a plant here.

Work is to start shortly on new plant to cost $150,000, owned by the J. P. Porter Co., for the manufacture of patent fuel out of anthracite screenings, etc.

Kitchener, Ont.
Work is to start shortly on $45,000 addition to warehouse owned by M. B. Shantz. General contractors, Reitzel Bros., Waterloo, Ont. Architects, Schmalz & Jones. Plastering and masonry, daywork under general contractors.

Lachine, Que.
Frank Peden, 65 McGill College Ave., is preparing plans of club house to be erected at Lachine Lake for Mount Island Golf Club, Inc.

London, Ont.
E. W. Moore, 30 Victor St., is having plans prepared for $20,000 store to be built on King St. Work not likely to start before spring.

Langley Fort, B. C.
North Langley Co-Operative Assn., is having plans prepared for a $5,000 feed warehouse. Work day labor by owners.

Montreal, Que.
P. J. Turner, 274 Beaver Hall Hill, is preparing plans of office building to be erected on St. James St., owned by Crown Trust Co.

Excavation work is in progress for 6 stores, theatre, bowling alley dance hall and meeting hall, total cost $250,000, on east side Park Ave. near Bernard Leger & Lamoreux, St. Denis building, are the general contractors and want prices on 6,000 ft. form lumber, stone, sand and reinforced steel; also wish to rent steam hoist. Decorative plastering and art (entire front) to be let by general contractor. No. materials purchased. Architect, R. Gariepy, 15 St. Jamss St.

Quebec, Que.
Foundations are in for $30,000 store and office at 343 St. Paul St., owned by La Cie D'Immeubles St. Paul Enrg. Work by day labor.

Sheet Harbor, N. S.
Albany Perforated Wrapping Paper Co., contemplate alterations to their pulp mill here, estimated to cost $250,000, and are in the market for main electric motor, 4,000 h.p., 60 cycle, and 2 or 3 secondary motors each 2,000 h.p. This work will start in May, 1924; day labor by owners.

St. Bruno, Que.
K. G. Rea, 285 Beaver Hall Hill, Montreal, is preparing plans of $75,000 club house for Mount Bruno Country Club. Tenders for this work will be called in the spring.

Senneterre, Que.
Bell River Pulp Co., Ltd., are having plans prepared for a pulp mill to be erected 56 miles east of Amos, Que. This work will go ahead during 1924.

Toronto, Ont.
Nasmiths Ltd., 42 Duchess St, contemplate an addition to their plant. Nothing definitely decided upon.

Foundations are going in for $100,000 theatre north east corner Woodbine and Danforth Aves., for Danforth-Woodbine Theatre Ltd. Architect, J. Hunt Stanford & Son, 67 Yonge Arcade. Carpentry by day labor. Roofing, plumbing, heating, electric, plastering and painting to be let.

Alterations to building for offices, at 17 and 19 Adelaide West, is contemplated by the owners, Jenkins & Hardy, 15½ Toronto St. Not definitely decided what will be done, or when.

Work is to start shortly on alterations and addition to stables on south side Pears Ave., costing $25,000, owned by Canada Bread Co., Ltd. Architect, W. R Bird, 6 King W., general contractors, Fred Holmes & Sons, Ltd. Sub-Contracts have not yet been let.

CONTRACTS AWARDED

Bathurst, N. S.
Geo. Eddy Co., Ltd., have the general contract for $8,000 drug store and office being built on King St. for J. H. Meahan. Tenders are being received till December 31 by general contractor for plastering, painting, electric, heating and plumbing.

Dixie, Que.
Foundations are in for $48,000 club house for Summerlea Golf Club, Montreal Millwork—Wm. Rutherford & Sons Co., Ltd., architect, C. R. Tetley, 314 Beaver Hall Hill, Montreal; general contractor, J. H. Salisbury 257, Walkley, Montreal.

Ford City, Ont.
The following sub-trades have been let on heat treat building owned by Ford Motor Company; steel sash—Canadian Metal Window & Steel Products Ltd., Toronto, roofing—A. W. Carmichael, Ltd., Walkerville, and Federal Cement & Tile Co., Chicago; plastering—Crawford & McGaw; glazing—C. M Bennett, Walkerville; terrazzo—Italian Mosiac & Marble Co., Ltd., London; miscellaneous iron—T. J Eanson & Sons, Windsor; electric wiring for operating steel doors—Beattie-McIntyre, Ltd., Toronto Architects, Albert Kahan, Ltd.; general contractors—Wells & Gray, Ltd., Ford, Ont.

Grande Ligne, Que.
The following sub-trades have been let on $80,000 gymnasium and workshop being erected for Feller Institute; millwork—Wm. Rutherford & Son; electric—H. R Cassidy, 255 Regent; ornamental iron—F. A. McKay Iron Works. Bremner Norris & Co., Ltd., Montreal, are the general contractors Architect, S. Comber, 127 Stanley St., Montreal.

Hamilton, Ont.
Hamilton Bridge Works Co. is supply-

ing the structural steel for foundry building to be built on Aberdeen West for Canadian Westinghouse Co. Tenders for balance of work are being received by the architect, B. H. Prack, Main East, Hamilton, and 50 Bay St., Toronto.

J. & G. Inrig, 206 Locke St. S. have the contract for sheet metal and ventilating, and Otis-Fensom Elevator Co., Ltd., the elevators, in connection with the Lister building being erected on James St. N. General contractors, Pigott- Healy Construction Co.; architect, B. H. Prack, Bay St., Toronto.

Longue Pointe, Que.

H. C. Johnston Ltd., 260 St. James St., has the general contract for $8,000 extension to foundry of Canadian Steel Foundries; roofing—Geo. W. Reed & Co., Ltd.; plumbing—W. G. Bailey, 145 Bleury St.

Montreal, Que.

The following sub-trades have been let on $15,000 warehouse being built here for Sherwin-Williams Co.; structural steel—Dominion Bridge Co., Ltd., Lachine, Que.; roofing—Campbell Gilday Co., Ltd.; plumbing—W. G. Evans, 4 Park Ave., electric to be let. Anglin Norcross Ltd., are the general contractors; architect—T. Pringle & Sons Ltd.

Work has started on repairs to bakery, costing $15,000, owned by Canada Bread Co., 611 Rivard St. Bremner Norris Co. have the general contract; structural steel—Phoenix Bridge & Iron Works, Ltd.,; roofing— Geo. W. Reed & Co. Sheet metal, electric, plumbing and heating to be let.

Work is in progress for repairs to warehouse at 84 St. Peter St., costing $14,000. General contractors—Cook & Letch, 258 Beaver Hall Hill; heating and plumbing—Selkirk Bros; elevator—Otis Fensom Elevator Co., Ltd.

Ottawa, Ont.

Geo. Graves Construction Co., Jackson building, have the general contract for $10,000 store being built on Bank St. G. Green, Bank and Fourth Ave., is the owner.

Sault Ste. Marie, Ont.

The following sub-trades have been let on $6,000 store block being built on Queen St., owned by Flockhart Bros., 421 Queen East; electric—K. L. Keith, 179 March St.; plumbing—S. F. Adland, 363 Queen E.; plastering—W. Wray, 332 Albert St. E.; painting—Wm. Hallam, 355 Queen E.; roofing by owner. Architect, T. Wilks, 612 Queen St.

Toronto, Ont.

Foundation work is to start shortly for addition to offices at 1301 Bloor West. Geo. Thompson, 823 Shaw St., has been awarded the general contract. Owner is Norman Baird, 1301 Bloor West.

Waterloo, Ont.

Foundations are going in for $9,000 warehouse on King St., owned by O'Donnell & Henderson. General contractors, Eller Bros; heating contract has been let to O. Gross, Waterloo.

Windsor, Ont.

Foundations are going in for 2 stores and 2 flats, on Sheppherd St. Plumbing and heating contract has been let to A. D. Belair, Park and Dougall Ave. Electric and plastering to be let. Owner and general contractor is J. E. St, Onze, 1052 London St. W.

Winnipeg, Man.

J. H. G. Russell, 1110 McArthur Bldg., is preparing plans of alterations to office building at 63 Albert St., owned by F. W. Hammond, 63 Albert St. General cntractor—W. A. Irish, 315 Kennedy Bldg.

Residences

Hamilton, Ont.

Chas. Salmon, 97 Ottawa St. S., is the owner and general contractor of $7,500 residence being built on Dalhousie St. Sub-trades to be let.

Kitchener, Ont.

A. Helm, 27 Shanley St., is owner and general contractor of $5,000 residence to be built on Shanley St. Plumbing, heating, electric and painting to be let.

A. H. Schweitzer, is owner and general contractor of $5,000 residence to be built on Strange St. Carpentry, plumbing, heating, plastering and painting to be let.

Mount Royal, Que.

F. G. Robb, 127 Stanley St., is preparing plans for $16,000 residence to be built near Montreal, for Wm. Wray, 617 University. Tenders will shortly be called by the architect.

Montreal, Que.

J. Cratton, 3138 St. Urbain, contemplates building a $10,000 residence on Laverdure, south of Gouin Blvd. Work to go ahead early in spring.

D. Belanger, 2052 Chateaubriand, is owner and builder of $8,000 residence on Chateaubrand, near Belanger. Masonry, millwork, roofing, electric, plumbing, plastering and painting to be let.

Foundations are in for $10,000 residence on Clarke, near Blvd. Gouin. Owner and builder is N. Paiement, 2795 St. Lawrence Blvd. Brickwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

C. Brochu, 547 Cuvillier St., contemplates building 15 flats corner Aylwin and Cuvillier Sts.; also stone and flats, $10,000 corner Rouen and Davidson Sts.,. Sub-trades to be let. Work will start early in spring.

J. A. Drouin, 1318 Iberville St., is owner and builder of $8,000 residence on Chapleau St., near Marie Ann. No materials purchased.

Plans have been drawn for $100,000 apartment house. S. Marotta, 195 Ste. Catherine E., is owner and builder. Work will likely go ahead this year or early next year.

Work is to start shortly on $10,000 residence on Henri Julien, between Villeray and Jules Verne. H. Papineau, 3276 Drolet St., is owner and general contractor. Electric, masonry, millwork, plastering and plumbing to be let. Roofing and painting by owner.

Outremont, Que.

Work is to start shortly for 2 flats, $14,000, to be built on Laviolette Ave. H. Bourbonnais, 690 Delormier is the owner.

Ottawa, Ont.

C. H. Stata, 209 Pretoria Ave., is owner and general contractor of $6,000 residence on Grove Ave.

Port Stanley, Ont.

Richard Mathews, Lydenham St., contemplates building $5,000 residence on Prospect St.

Stratford, Ont.

Wm. Elligsen, Centre St., contemplates building 2 residences, $6,000, on Yonge St.

St. Thomas, Ont.

Foundations are in for 2 residences, $10,000, on Talbot St. Owner is A. E. Thomas, 223 Talbot St.

Toronto, Ont.

Foundations are going in for $7,000 residence south side Garfield Ave., near Sighthill Ave. Harry Jenkins, 341 St. Clair Ave., is the owner and general contractor, who supervises all work, and will let plastering, heating, electric, plumbing and painting. Carpentry and masonry by day labor.

Foundations are going in for $8,000 residence at 143 Glenrose Ave. P. N. Alexander, 151 Bedford Park Ave., is the owner and builder who will let heating, electric, plumbing, plastering and painting. Carpentry and masonry by day labor.

Foundations are in for 1 pair and 1 single residence, $12,000, east side Woodfield Ave., near Gerrard Rd. Owner and builder—Forton & Driffield, 72 Hiawatha. Masonry day labor. Electric, plumbing, heating, plastering, and painting to be let.

Work is to start shortly on 2 pair residences, $7,000 a pair. west side Ashdale Ave., near Gerrard E. Owner and builder is S. F. Lankin, 667 Pape Ave. Heating, painting, electric, plastering and plumbing to be let. Masonry by day labor.

H. E. Warrington, 222 Woodbine Ave., contemplates building 1 pair residences, $7,000, east side Rhodes, near Hanson Ave. Painting, plastering, electric, plumbing and heating to be let. Masonry day labor.

Work is to start shortly for 1 pair residences, $7,000, east side Elmer, near Rhyl Ave. Owner is Mrs. H. Mattacott, 5 Maughan Crescent. Painting, plastering, electric, plumbing and heating to be let.

Foundations are in for $7,000 residence south side Garfield Ave., near Welland. H. Jenkins, 341 St. Clair Ave. E., is owner and builder, who will let heating, painting, electric, plastering and plumbing.

W. Carter, 540 Dovercourt Rd., is owner and builder of $7,500 residence south side Raymond Ave., near Brummell Ave. Tenders are being received on heating, painting, electric, plastering and plumbing.

Walls are going up for 1 pair residences, $7,500, south side Strathmore Blvd., near Coxwell Ave. Owners and builders, Jackson & Mitchell, 853 Logan Ave. Masonry day labor. Plastering, painting, electric, heating and plumbing to be let.

Foundations are going in for $30,000 residence south side Highland Ave., near Glen Rd., for F. H. Wilkes, care architects, Waters & Wilkes, 43 Scott St. Carpentry and masonry by general con-

(Continued on page 49)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TENDERS

Sealed tenders will be received for the construction of a brick Maintenance Shop at Hillcrest Yard, Bathurst St. and Davenport Road, Toronto.

Tenders shall include all of the work contemplated, including all Masonry, Concrete Work, Structural Steel, Plumbing, Heating and Electric Wiring and all other work necessary for the completion of the building.

All tenders are to be endorsed "Tender for Maintenance Shop, Hillcrest Yard,, and are to be addressed to the Chairman of the Toronto Transportation Commission and are to be delivered to the offices of the Commission, 35 Yonge St., not later than 12 noon on

Friday, January 4th, 1924,

All tenders must be on the Commission's form of tender and must be accompanied by an accepted bank cheque payable to the Toronto Transportation Commission for 2½% of the amount of the tender.

Plans, specifications, form of tender and instructions to bidders may be obtained on and after 12 noon, Wednesday, Dec. 19th, at the Commission's Buildings Dept. 3rd floor, 35 Yonge St., Toronto.

The lowest or any tender not necessarily accepted.

H. H. COUZENS,
General Manager,
Toronto Transportation
Commission.

51

Sealed tenders addressed to the undersigned, and endorsed "Tender for wharf reconstruction and dredging, at Pembroke, Ont.," will be received at this office until 12 o'clock noon,

Wednesday, January 9, 1924,

for the reconstruction of a public wharf and dredging a basin and boat channel, at Pembroke, County of Renfrew, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the office of the District Engineer, Equity Building, Toronto, Ont., and at the Post Offices, Pembroke, Ont., and North Bay, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $25.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
L. H. COLMAN,
Secretary.

Department of Public Works,
Ottawa, December 17, 1923 51-52

POSITION WANTED BY STEAM ENGINEER with portable and hoisting Engineer's certificate, also second-class stationary certificate. Have full set of boiler tools and can do all own repair work. with best of references. Apply to R. Black, Corbetton, Ontario. 51

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

ESSEX BORDER UTILITIES COMMISSION

Tenders for Water Purification Plant

Sealed tenders addressed to the Secretary of the Commission will be received by the Essex Border Utilities Commission, Heintzman Building, Windsor, Ontario, up to 4 p.m. on

Thursday, December 27, 1923,

for the following contracts connected with the construction of a water purification plant in Ford City, Ontario.

(a) **Construction of reinforced concrete Filters, coagulating basins, pure water reservoir, office building, etc.**
(b) **Supplying 42" diameter steel pipe.**
(c) **Supplying cast iron pipe and specials.**
(d) **Supplying valves and sluice gates.**
(e) **Supplying Rate Controllers and operating tables.**

Plans and specifications can be obtained and further information secured from J. Clark Keith, Chief Engineer of the Commission, Windsor, Ontario, or from Gore, Nasmith & Storrie, Consulting Engineers, 625 Confederation Life Bldg., Toronto, Ontario.

A cheque for $10.00 must be submitted before plans and specifications can be obtained for the construction contract (a) which will be returned on tenders being submitted.

A marked deposit cheque for 5% of the tender sum must accompany all tenders.

These tenders will be opened at a public meeting to be held in the office of the Commission at 4 p.m., Thursday, December 27th, 1923.

The Commission reserves the right to accept any or reject all tenders.

R. B. BRAID,
Secretary.

50-51

Too little attention is given, according to Mr. H. F. Kleinfeldt, to the proper size of pebbles for the grinding of a certain kind of material to a given fineness. If the grinding consists in the reduction of a fairly coarse material, say, about ¼ in. to ½ in., and it is not necessary to grind the finished product very fine, a large pebble or ball should be employed. If the feed consists of a mixture of coarse and fine material, it is advisable to take a mixture of small and large pebbles or balls. If the material is fed in a fairly fine condition, say, from 8 to 20 mesh, and the resulting product is to be extremely fine, it is advisable to use small pebbles or balls. In other words, the idea in fine grinding is to have as many points of contact as possible with a pebble or ball of sufficient weight, so that the impact is sufficient to reduce the material to be ground. It can be readily seen from this that the ideal condition is obtained with maximum points of contact and with pebbles or balls of sufficient weight to grind or pulverize the material. This is true in either wet or dry grinding In the case of dry grinding, the moisture content of the material to be ground is very important and it has been definitely established that greater efficiency is obtained when the material is as free from moisture as possible.

According to some elaborate tests carried out by the American Society of Testing on the painting of iron and steel, the following points have been developed:—(1) The thorough methods of preparation, i.e , sand blasting and picking, show no superiority over ordinary methods of removing loose scale, rust and dirt by scraping, brushing and wiping. This applies to both new steel and old steel which has been in service. (2) Weathering to permit loosening and partial removing of mill scale before painting is inimical to preservation. (3) Painting in a cold dry atmosphere gives results as good as in warm dry atmosphere, or on heated steel. (This may be due to the greater thickness of coatings applied in the cold atmosphere.) (4) The preparation of old painted steel surfaces, which have bare rusted spots, by brush coating with benzine over and around the rust spots, burning the benzine off and then scraping and wire brushing, gives better results than scraping and wire brushing without the benzine treatment and better results than sand blasting. (5) There is no difference observable in the results of the application of the same methods to old and to new steel.

In view of the progress in recent years in the design and construction of hydraulic turbines, with their sensative automatic control devices and the nicety of balance that is now attained, it is a decided shock, says the Engineering News-Record, to hear of a large unit being actually installed with something so far wrong in design as to prevent successful operation. A 40,000 horse-power water wheel, on being put in service, vibrated so seriously that the power company shut it down, but finally the trouble was corrected, or at least reduced it to safe limits, by the comparatively rough method of decreasing the runner diameter 5 in. by cutting off metal around its entire circumference with an oxy-acetylene blow-pipe.

Residences

(Continued from page 47)

tractors, W. W. Petley & Co., who will let other mechanical trades.

L. Munnings, 160 Hillary Ave., is owner and builder of 3 residences, $10,000, west side Watt Ave., near Kersdale Ave. Painting, plastering, electric, plumbing and heating to be let. Masonry day labor.

J. A. Houden, 236 Humberside Ave., is owner and builder of $8,500 residence and garage, south side Baby Point Rd., near Thornhill Ave. Plastering, painting, electric, heating and plumbing to be let.

Excavation work is in progress for block of stores and apartments south west corner St. Clair Ave. and Northcliffe Blvd., owned by Ralph Building Construction Co. Tenders on all trades are being received by the architect, B. Swartz, 336 Dundas West.

Work is to start shortly for 1 pair residences, $7,500, at 16-18 Normandy Blvd., owned by Hewitt & Roberts, 641 Glebeholme Ave. Masonry by day labor. Plastering, painting, electric, heating and plumbing to be let.

Foundations are going in for 2 pair residences, $7,500 a pair, east side Cannon Ave. near Gerrard East. Alex. Hussy, 54 Ravina Crescent is the owner and builder. Masonry by day labor. Plastering, heating, electric, plumbing and painting to be let.

Walls are up 1 storey for 1 pair residences, $7,000, south side 8th Ave near Woodbine Ave. Owner and builder is A. J. Baldwin, 167 Coleridge Ave., who is receiving tenders on electric, heating, painting, plastering and plumbing.

Foundations are in for 1 pair residences, $7,500, west side Cannon Ave. near Gerrard E. Owner and builder—Gaylord & Wood, 58 Eaton Ave. Masonry by day labor. Plastering, heating, electric, plumbing and painting to be let.

Foundations are going in for 2 pair residences, $7,000 a pair, north side Castlefield Ave., near Avenue Rd. Owner and builder is Maurice Rash, 218 Bellwoods Ave., who will let painting, plastering, electric, plumbing and heating trades. Masonry by day labor.

Foundations are going in for 2 residences, $3,500 each, north side Balliol St., near Forsyth Ave. Masonry day labor. Plastering, painting, electric, heating and plumbing to be let by owner and builder, Peter McMaster, Scarboro Jct.

Excavating work has been done for 2 residences, $4,000 each, north side Westbrook, near Chisholm Ave. Owner and builder is I. Hopkins, 19 Westbrook Ave. Masonry day labor. Plastering, painting, electric, heating and plumbing to be let.

Work is to start shortly on 2 pair houses, $7,000 pair, west side Coxwell, near Danforth. Thos. Bros., 304 Glebemount Ave., are the owners and builders. Electric, plastering, painting, heating and plumbing trades to be let.

Foundations are going in for $8,500 residence east side Rosewell Ave., near Glengrove. Owner and builder is E. Ward & Son, 21 Richmond W., and will let painting, plastering, electric, plumbing and heating trades. Carpentry and masonry by day labor.

Jno. Carr, 4 Oakdeane Crescent, is owner and builder of 4 pair residences, $7,000 a pair, on Montgomery Ave. Tenders are being received by owner on brickwork. Other trades to be let later.

Excavation work is being done for 2 pair residences, $20,000, north west corner Lappin and St. Clarens Ave. E. Longo, 301 Osler Ave., is owner and builder. Plastering, painting, electric, heating and plumbing to be let.

A. G. Laughton, 154 Evelyn Crescent, is owner and builder of 2 residences $6,500 each, 105-7 Evans Ave. Electric, plumbing and heating to be let. Carpentry by owners own staff.

The walls are going up for 1 pair residences, $4,000 each, east side Kent Rd., near Applegrove. Fred Stevens, 2 Beck Ave., is owner and builder. Electric, heating and plumbing to be let.

Footings are in for 2 residences, $6,000 each, at 140-2 Gilbert Ave. Harry Steadman, 190 Northcliffe Blvd., is owner and builder.

Foundations are going in for 2 residences, $6,500 each, at 673-5 Windermere Ave. E. B. Luney, 664 Abbette St., is owner and builder. Electric, plumbing, painting, plastering and heating trades to be let.

Tillsonburg, Ont.

Steven Scott is owner of $5,000 residence being built on Brock St. Work by day labor. No materials purchased.

CONTRACTS AWARDED

Aylmer, Que.

N. Beaupre, Aylmer, Que., has the general contract for building ten residences here, total cost $40,000.

Cooksville, Ont.

The walls are up for $6,000 residence on Melville Park. Following sub-trades have been let; plumbing—J. W. Scott, Port Credit; electric—H. V. Moore, Cooksville. Painting and heating to be let. Owner and builder is W. F. B. Rubidge, Port Credit.

Montreal, Que.

The following sub-trades have been let on $15,000 residence being built corner Queen Mary and Finchley Road, for J. T. Stranger & Co., 10 St. John St.; millwork—Wm. Rutherford & Son. roofing—Geo. W. Reed & Co.; painting and glazing by general contractor, C. Thompson, care H. S. Taylor & Co. Marble, plastering and tiling to be let.

Work is in progress for $25,000 repairs to residence at 443 University Ave., owned by Parish of Christ Church. Masonry, painting and glazing by general contractor, Purdy & Henderson Co., Ltd. Millwork and plastering trades to be let. Architects, Ross & MacDonald.

H. R. Cassidy, 255 Regent St., has the contract for electrical work and Brown & Son, 26 Victoria Sq. tiling, in connection with repairs to residence at 595 Pine Ave., costing $15,000 for A. Colville, 595 Pine Ave. General contractor is A. K. Hutchison, 10 Cathcart St.

The frame-work is now going up for 12 residences, $96,000 on Harvard, between Monkland and Terrebonne. Owner and builder, Badgley Construction Co. Painting and glazing by L. Asselin, 123 Orcleans St. Masonry, millwork, roofing, electric, plumbing, heating, plastering and tiling to be let.

Excavating work is being done for 4 flats, $15,000, between 32nd and 33rd Aves. A. Lalonde, 288 Marlowe Ave., is owner and builder; excavation and foundations—M. St. Denis, care owner; millwork—L. Villeneuve & Cie, Ltd., 2599 St. Lawrence Blvd. Roofing, electric, plumbing, plastering, painting and glazing to be let.

Foundations are going in for $9,000 residence on Old Orchard, between Monkland and Cote Station, for L. S. Mitchell, 421 Decarie Blvd. L. Lavigne, 1352 Wellington St., is the general contractor. Masonry, millwork, roofing, electric, plumbing, heating, painting, glazing and plastering to be let.

F. Bellehumeur, 1231 Parthenais St., has the general contract for $8,000 residence being built on Ontario, between Joliette and Chambly, for Miss P. Presseau, 947 Dorchester St. Masonry, millwork, roofing, electric, plumbing and plastering to be let.

Outremont, Que.

G. R. Licker Co., 143 Mansfield, has the contract for tiling in connection with $27,000 cottage being built on Maplewood, corner McCullock, for Jas. Moguin, 1158 St. Hubert St. General contractor, Collett & Freres, 243 St. Hubert St.; architects — Perrault & Gadbois.

Ottawa, Ont.

The walls are going up for $6,000 residence on Brighton Ave. Following sub-trades have been let; electric—H. L. Allen; plastering — Patterson Bros.; plumbing and heating—J. Allen, Euclid Ave.; painting by day labor. Owner and general contractor—Rostetter & Taylor, 89 Belmont Ave.

The following sub-trades have been let in connection with altering store into apartments, on Arlington Ave., to cost $11,000; electric—Wallace Chugg, Bank and Second Ave.; plumbing and heating —F. Bronke, Hurdmans Bridge; plastering—P. Beaupry, Henry St.; painting by day labor. General contractor is J. B. Daust, Carleton.

The following sub-trades have been let on $60,000 residence being built on Riverdale Ave.; electric — J. A. Elliott, Bank and Strathcona Ave.; plumbing and heating — Vand & Cole; plastering — T Patterson, Rosedale Ave.; painting by day work. Owner and general contractor is E. O. Switzer, Britannia Heights, near Ottawa.

The walls are going up for 2 residences, $10,000 on Sunset Blvd. The following sub-trades have been let; electric—Stan. Lewis, 63 Metcalfe St.; plumbing and heating—W. G. Edge Co., Ltd. Plastering and painting by day labor. Owner and general contractor, Graves Construction Co., Ltd.

The following sub-trades have been let on $7,000 residence being built on Powell Ave. for David Arbuckle, 215 Argyle Ave., owner and general contractor; electric—J. A. Ellicott, Bank and Strathcona Sts.; plastering—W. Green, care owner; plumbing and heating—F. Branke, Hurdmans Bridge; painting by day labor.

Port Colborne, Ont.

F. C. Kulow has the contract for heating and plumbing, and Peter Beam the plastering, on 2 residences, $3,200 each, being built on Steel St., for L. Turnbull.

Long & Schneider, Humberstone, are the general contractors.

Foundations are in for 2 residences, $3,500 each, on Alexandria St., for Otto Eberling, owner and builder. Electric work—Walters Electric Co., Humberstone, Ont.; plastering — Peter Beam, Port Colborne.

St. Laurent, Que.

Foundations are going in for $5,000 residence on Cardinal St. J. E. Belanger, 163 St. Germain St., is the general contractor. Owner, Mrs. R. Falardeau, 1502 Papineau St., Montreal. Brickwork, roofing, electric, plumbing, plastering, painting and glazing to be let

Sarnia, Ont.

The following sub-trades have been let on $9,000 residence being built on London Rd., for Chas. H. Hanson, 257 S. Christina St.; electric — Chambers Electric Co.; plumbing and heating—W. J. Barrie, North Chestnut St.; plastering — J. Craig, Richard St.; painting and glazing—Carter Decorating Co., Ltd. D. W. Giffin, Durand St., is the general contractor.

Toronto, Ont.

The following sub-trades have been let on $25,000 residence, north side Ravine Drive and Strathearn Blvd., for S. Rogers, Imperial Oil Bldg.; electric, plumbing and heating — Mechanical Trades Ltd.; masonry—J. Rees, 14 Lark St.; carpentry—R. T. Tobin & Son; plastering—Robertson & Findlay; painting—D. Nedley, Doncrest Ave.; tiling—Italian Mosaic & Tile Co., Ltd. Architects, Horwood & White, 299 Yonge St.

The walls are up one storey for 1 pair residences, $7,000, north side Gerrard E. near Hollywood Crescent. A Cornell, 127 Normandy Blvd. is the owner and builder. Plumbing and heating—Jos. Foster, 682 Kingston Rd. Painting day labor. Other trades by owners own staff and buys material as required.

The following sub-trades have been let on 1 pair residences, $7,500, east side Eighth Ave. for Chas. C. Rigby, 234 Milverton Blvd., owner and builder; electric —T. B. Kilner, 195 Gillard Ave.; plumbing—J. W. Barrett, 209 Milverton Blvd.; heating—York Sheet Metal Co.; painting —A. Stone, care owner.

The walls are going up for $12,000 duplex residence at 4 Northcliffe Blvd., owned by Harry J. Long, 76 Glendonwynne Ave. Following sub-trades have been let; electric—P. J. Dunn, 243 Fairview Blvd.; plumbing — H. Ruddick, 54 Appleton Ave.; heating—J. G. Jackson, 311 Kennedy Ave.; plastering—Saderley & Bushel, care builder.

E. Longon, 301 Osler Ave., has been awarded the contract for footings in connection with $126,000 apartment house being erected south west corner Homewood Ave. and Wellesley Cres. Owner is D. Lavine, 308 St. Clair West; architects, Kaplan & Sprachman, 298 Dundas W.

A Grant, 837 Logan Ave., has been awarded the general contract for building $10,500 detached residence south side Alexander Blvd., for A. V. Orr, 18 Lake Front.

Wm. J. Webb, 49 Triller Ave., is the builder of $9,000 duplex residence at 17 Glendale Ave., for Arthur W. Morley, care builder. Plumbing, heating, electric, plastering and painting to be let.

The following sub-trades have been let on 1 pair residences, $7,500, west side Kingswood Rd., near Swanwick Ave.; electric—R. Smith, 371 Woodbine Ave.; plumbing—W. Watson, 10 Blong Ave.; heating—York Sheet Metal Co., 38 Ferrier Ave.; plastering—J. Thomas, 131 Chisholm Ave.; painting — Mr. Hockey. care owner and builder, H. McCaffery, 25 Meagher.

W. Boxall, 1083 St. Clarens Ave., has the plumbing and heating contract for $7,500 residence east side Arlington Ave. near High St. Owners and builders—Rayfield & Shenfield, 185 Westmount Ave.

I. Maude, 19 Rowland Ave., has the heating and plumbing contract on $15,000 residence being built at 216 Howard Park Ave., for J. C. Raynor, 292a Runnymede Rd.

C. May, 498 Main St., is owner and builder of 2 residences, $4,000 each, east side Meagher, near Orley Ave. Electric, plastering and plumbing to be let. Painting by owner, day labor. Heating—Matthewson Hardware Co. 177 Queen East.

Geo. Durie, 54 Iona Ave., is owner and builder of 2 residences, $4,000 each, east side Meagher, near Westbrook Ave. Masonry day labor. Electric, plastering, painting, heating and plumbing to be let.

Foundations are in for $14,000 residence north side Chaplin Cres., near Lascelles Blvd. Burk & Co., 18 Toronto St., are the owners and builders. Masonry day labor. Carpentry — Robt. Glenny, 27 McPherson Ave. Other trades to be let.

Windsor, Ont.

A. McKenzie, 379 Wellington Ave., has the general contract for $5,000 residence to be built on Dougall Ave., for Wm. Beatman, 1241 Dougall Ave. Electric, plastering, painting and plumbing to be let. No material purchased.

M. Marentette, 815 Brant St., is the general contractor for $6,000 residence on Arthur St., owned by E. Cote, 813 Sandwich St. E. Electric, plastering and plumbing to be let.

Power Plants, Electricity and Telephones

Hemming's Falls, Que.

Work is in progress on railway running into site of $1,500,000 power development and dam owned by Southern Canada Power Co., Montreal. General contractors are Foundation Co., Ltd., Montreal. All trades to be let shortly.

Nictaux Falls, N. S.

Middleton town council contemplate the installation of a $20,000 power unit. By-law on this work will shortly be submitted to ratepayers, and if passed, work will probably proceed in 1924.

Wheatley, Ont.

Work is to start at once for $13,000 electric lighting system. A new hydro line is to be built from Leamington and system equipped at Wheatley. All work under direction of Ontario Hydro Power engineers.

CONTRACTS AWARDED

Fort William, Ont.

Foundation is in for $15,000 transformer for Great Lakes Paper Co., Ltd., of Fort William. General contractor and architect — Barnett & McQueen, Ltd., Fort William.

Port Hope, Ont.

Clarence Villsworth, Port Hope, has the contract for electrical work on $16,000 telephone exchange being built here. Painting and glazing by general contractor, Garnett & Sons.

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If you have been awarded a supply contract by the City of Toronto, you will be asked to furnish a bond of a Surety Company.

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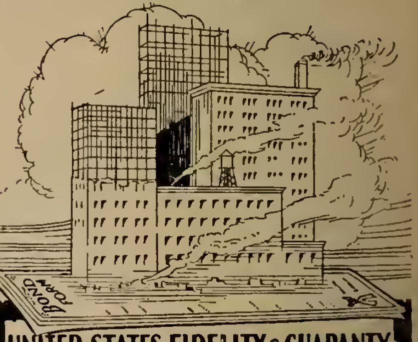

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Canadian Pacific Railway Company's Lake Terminal Elevator

The Canadian Pacific Railway's 4,000,000 bushel Reinforced Concrete Grain Elevator is located at Port McNicoll, Ont. It was designed and built by the John S. Metcalf Co. Ltd., of Montreal, and this modern and fire-proof Elevator is one of the finest in Canada.

The storage capacity is made up of 64 circular bins, 33 feet inside diameter by 80 feet in height, and has 62 interspace bins. There is also a large Working House, two travelling marine towers and Power Plant with two turbo-generators.

Due to its height and its location in the open along the Lake front, this Elevator is necessarily subjected to enormous wind pressure as well as the vibration of the Railroads operating on the ground and the machinery and conveyor equipment operating within. To meet these conditions the Engineers chose RAIL STEEL REINFORCING manufactured from standard section Tee Rails in accordance with A.S.T.M. SPECIFICATION A-16-14, and CANADIAN ENGINEERING STANDARDS ASSOCIATION Specification A-9-1923-B.

700 tons of RAIL STEEL BARS were used to reinforce this Structure.

Specify your reinforcing steel to meet ASTM Specification A-16-14 or Canadian Engineering Standards Association A-9-1923-B.

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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	68-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.60 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.75 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	,30	.35	.35
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	,45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50—6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
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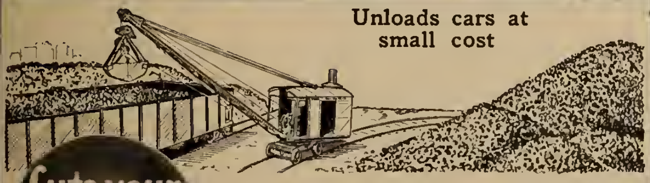

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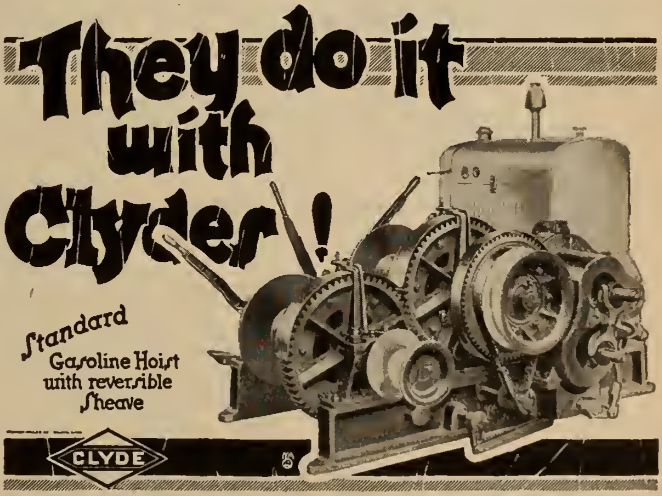

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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	41/45	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	45/60	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.00	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.17	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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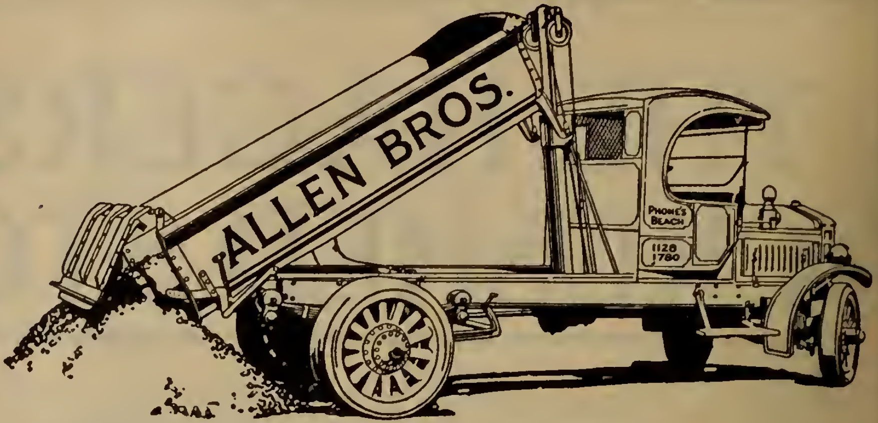

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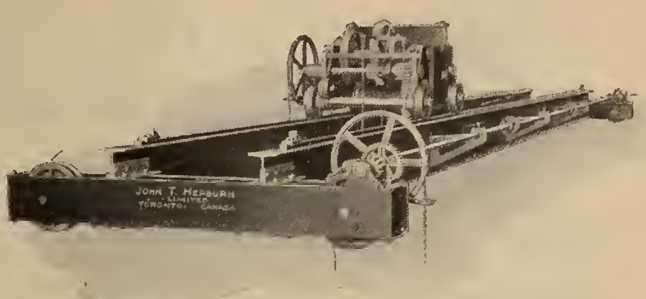

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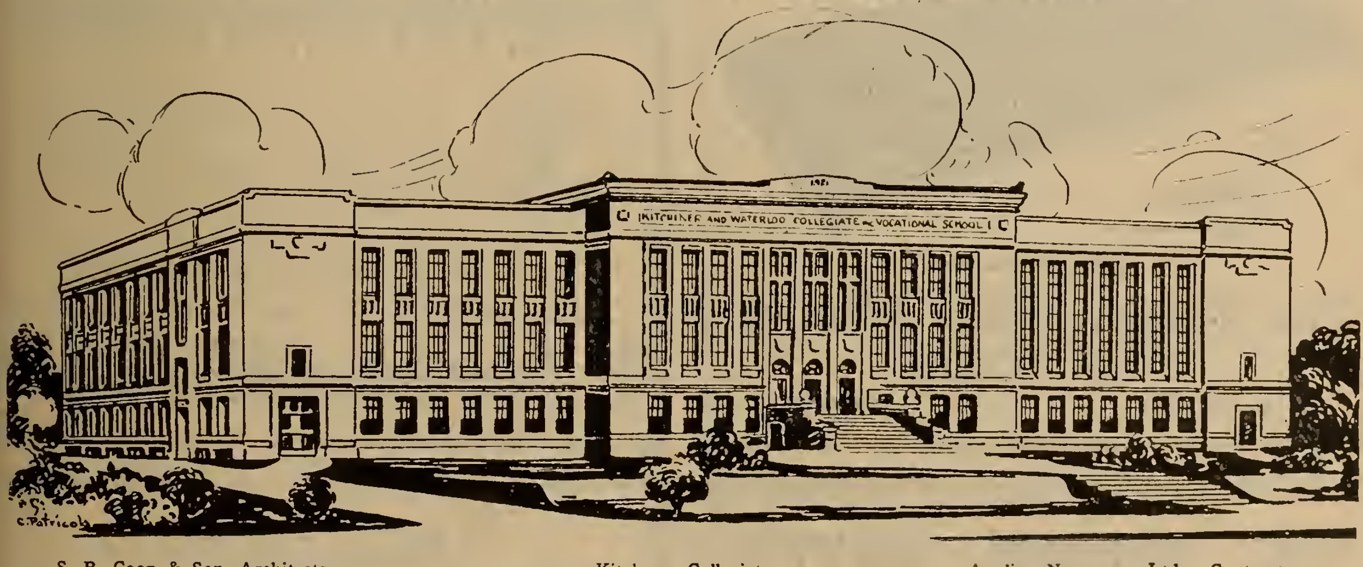
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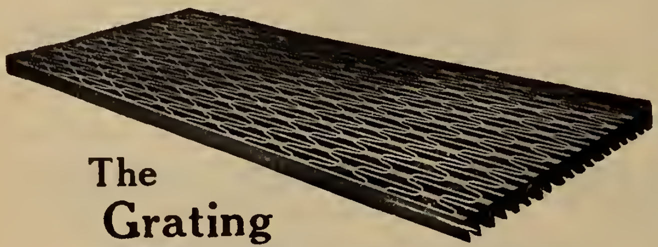

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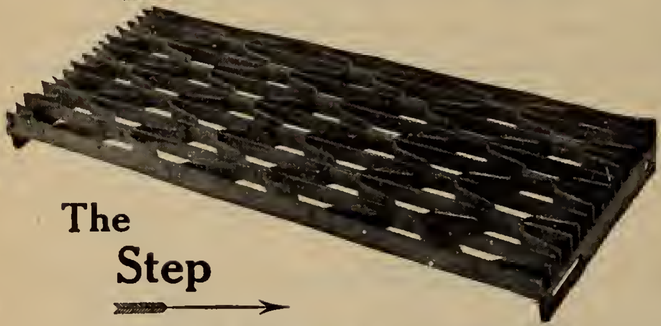

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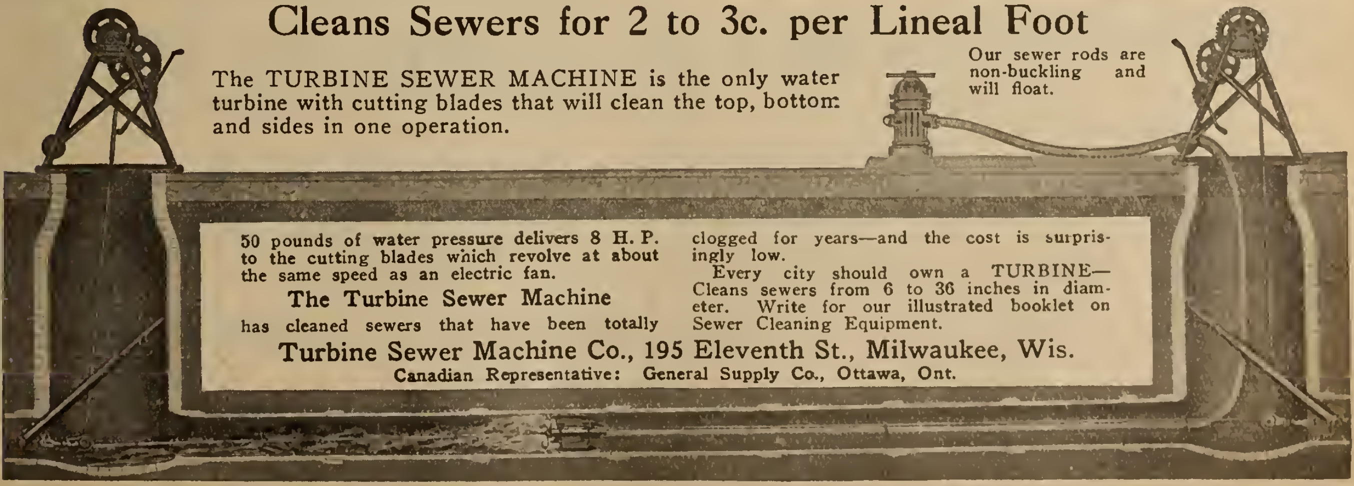

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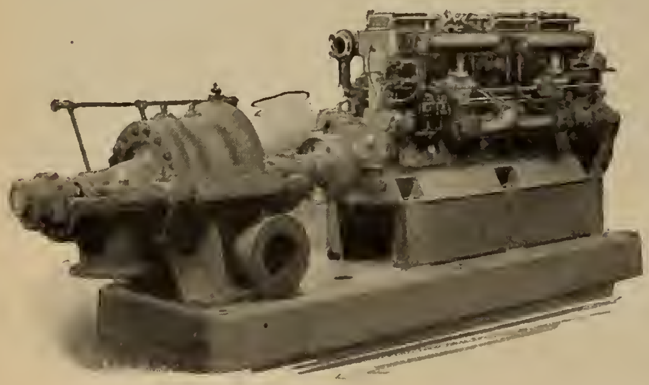

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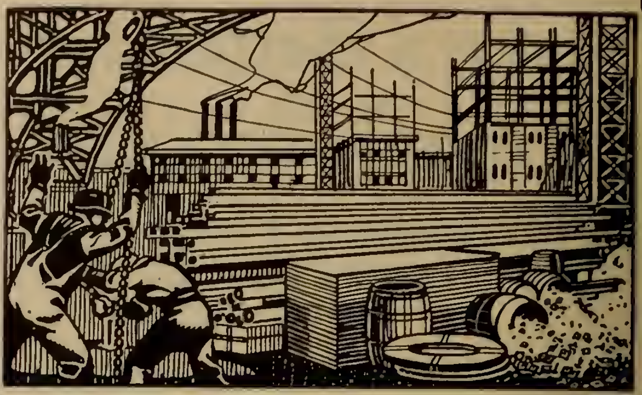

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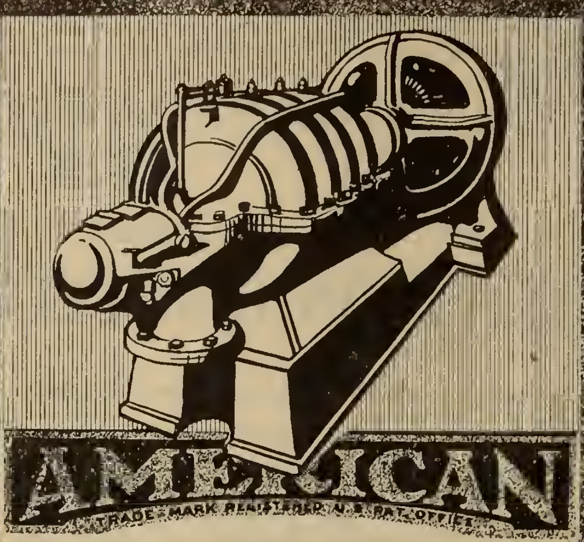
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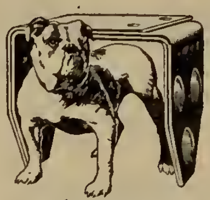

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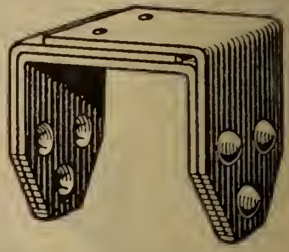

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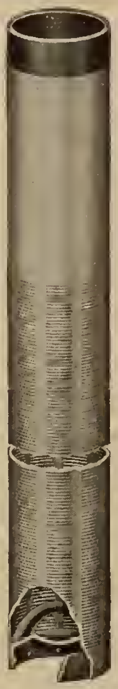

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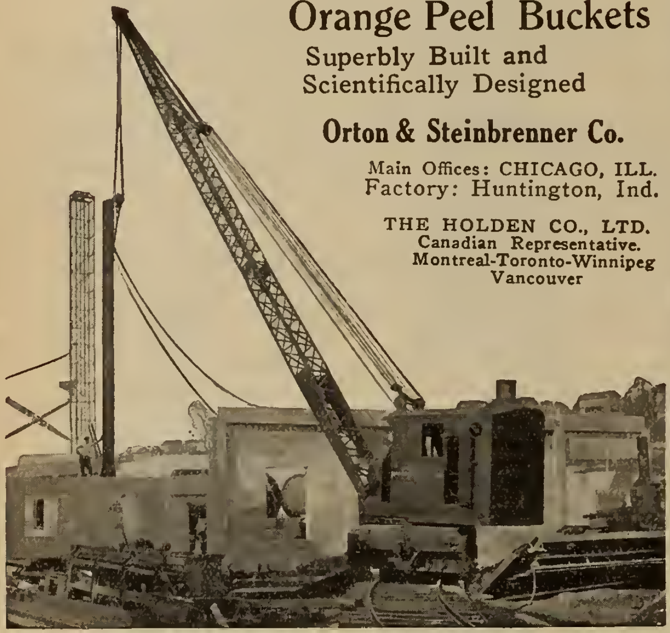

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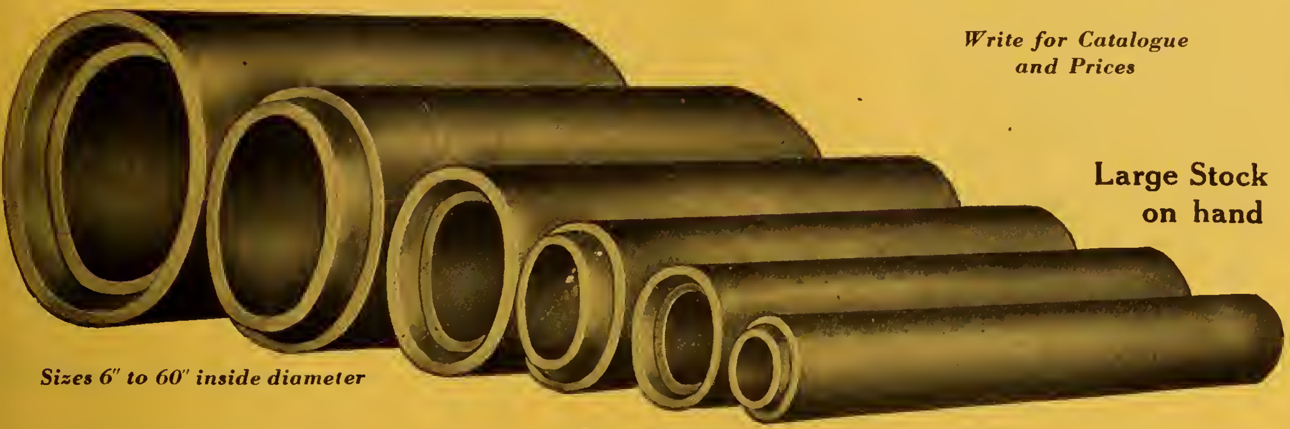

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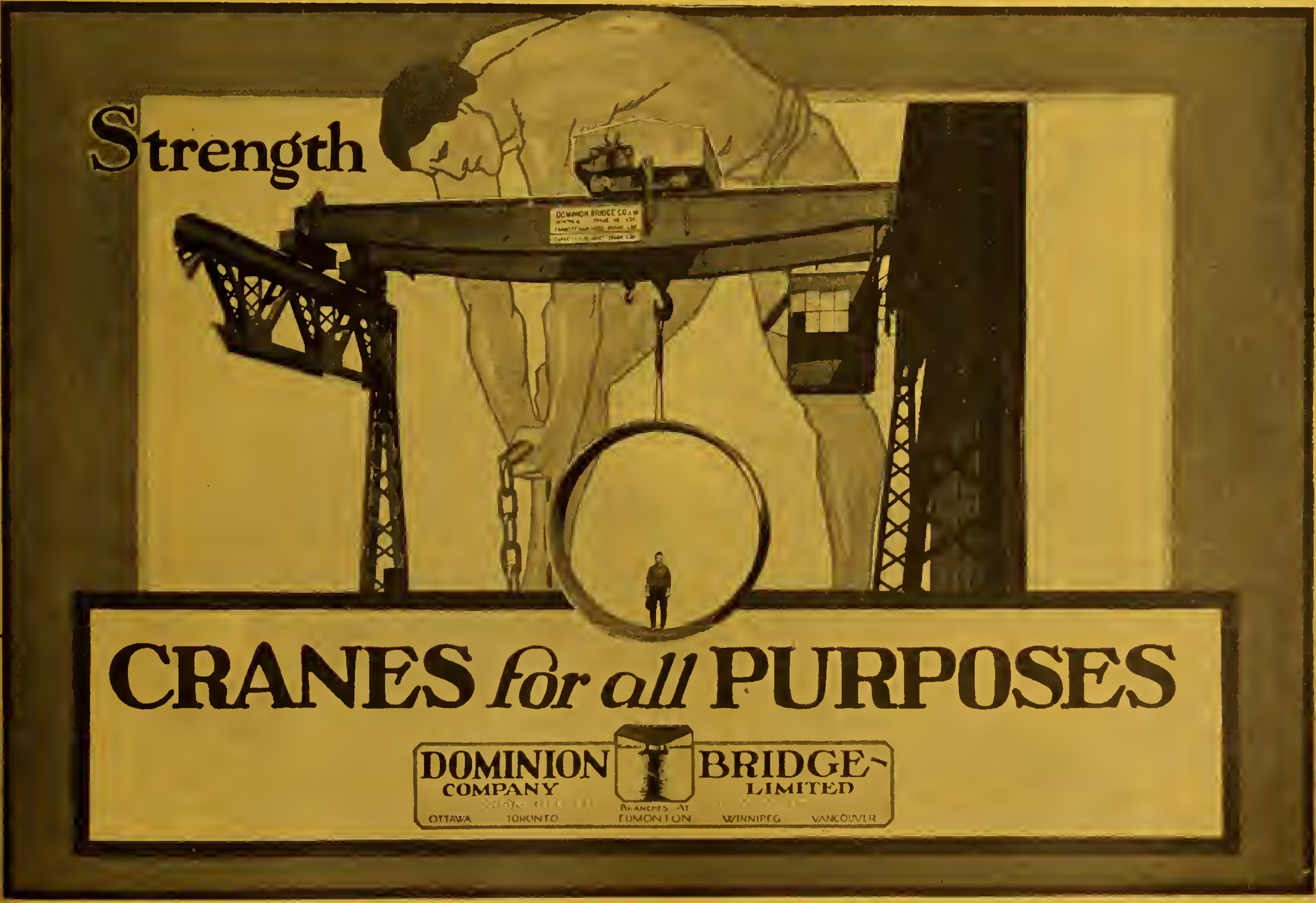

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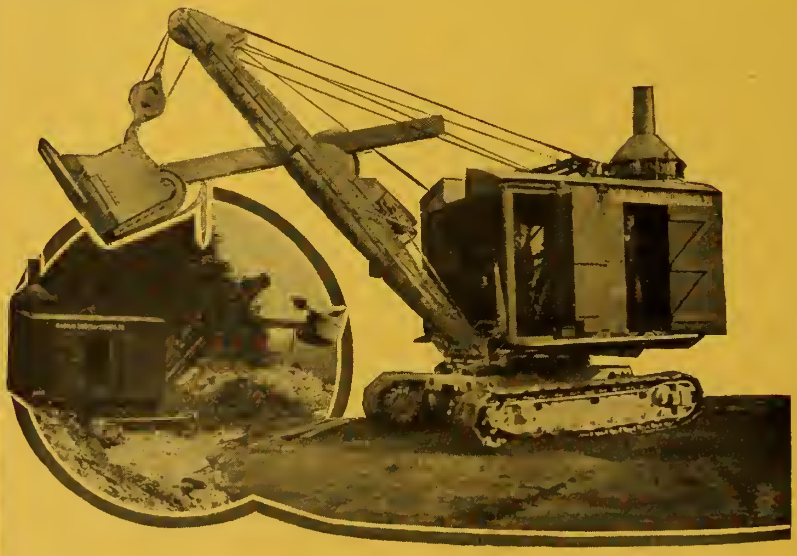

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Contract Record and Engineering Review

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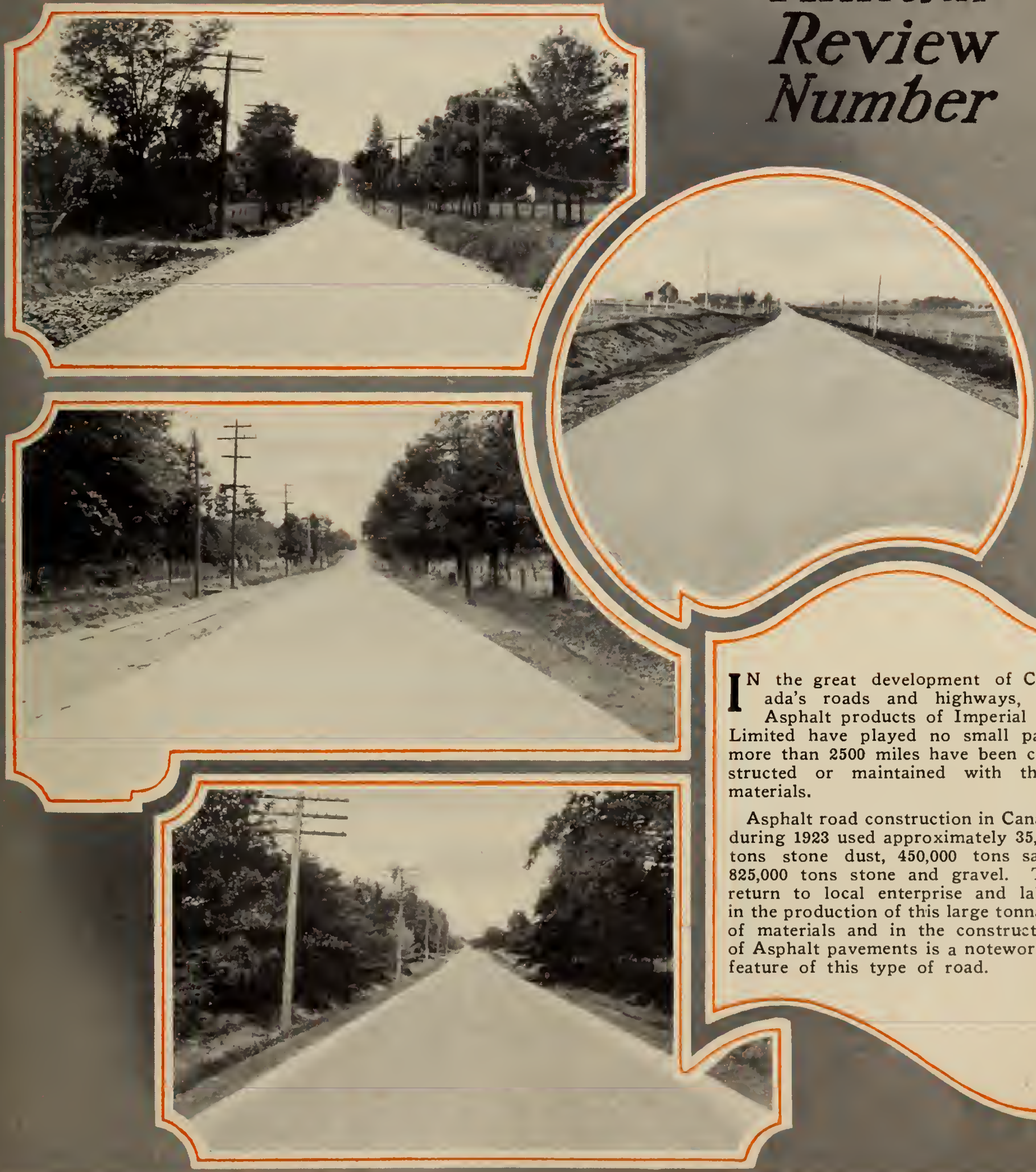

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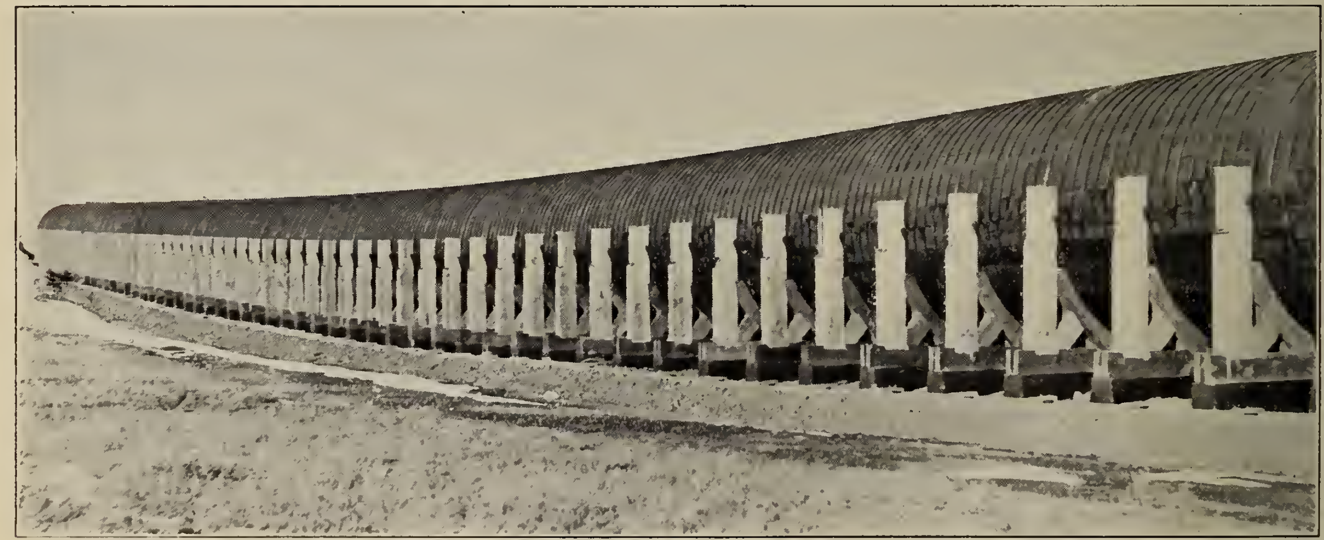

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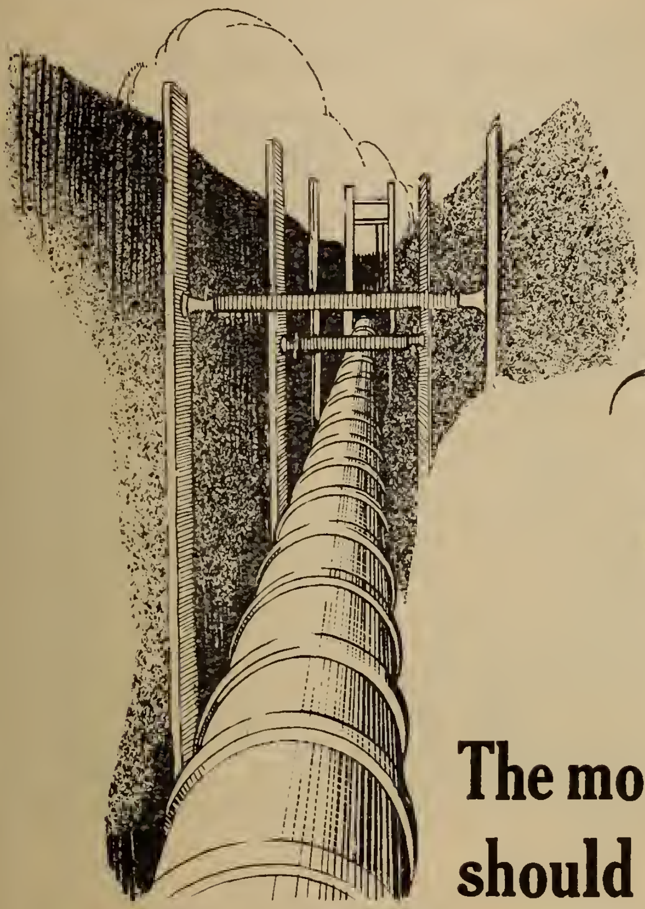

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The Toronto Plate Glass Importing Company, Limited

91 DON ROADWAY - - TORONTO

THE NEW FORD PLANT AT TORONTO

LOWER LEFT—Continuous run of Ormsby Lupton sidewall sash 440'-0" long by 10'-3⅛" high.
CENTRE—Shows mechanical power which operates run of sidewall ventilators using Lupton type operator.
UPPER RIGHT—Interior view from end of typical "A" frame installation. Note upper runs of sash controlled by motor driven Pond operating device.
OVAL—Exterior of 2 complete monitors and one "A" frame.

Step Up to Bigger and Better Things in '24

Ormsby accomplishments in 1923 include the successful completion of several exceptional contracts, of which the above is an example. The integrity of the Ormsby organization will rise to the greater opportunities of a new year with the strength of a wider experience and the determination to maintain supreme service in the field covered by Ormsby products. We shall be happy to co-operate with you toward the greater progress of engineering and building in Canada during 1924.

ORMSBY PRODUCTS

- Ormsby Lupton Steel Sash
- Ormsby Hollow Metal Sash
- Ormsby Rolling Steel Doors
- Ormsby Kalemein Copper Doors
- Ormsby Kalemein Bronze Doors
- Ormsby Tin Clad Doors
- Ormsby Revolving Doors
- Ormsby Kalemein Doors
- Ormsby Counterbalanced Doors
- Anything in sheet metal up to 10 gauge
- Ormsby Skylights
- Ormsby Swartwout Ventilators
- Ormsby Tanks Welded
- Ormsby Tanks Riveted
- Ormsby Transformer Tanks
- Ormsby Garages Metal Clad
- Ormsby Special Building
- Ormsby Corner Bead
- Herringbone Metal Lath
- Expanded Metal Lath
- Roofing of all kinds
- Jobbing Contractors.

THE A. B. ORMSBY COMPANY, LIMITED

48 Abell St., Toronto, Ontario

Associated with

The Metal Shingle & Siding Co., Limited

Preston and Montreal

Agents: New Brunswick, J. Charlton Berrie, St. John; Nova Scotia: F. A. Gillis Co. Ltd., Halifax; British Columbia: A. T. Chambers, Vancouver
Ottawa, Ontario: The Canada Engineering & Construction Co., Ltd.
Western Canada Representatives: Western Steel Products, Limited
Winnipeg, Regina, Saskatoon, Calgary, Edmonton

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

- Acid Proof Fans
  - Canadian Blower & Forge Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
  - Canadian Blower & Forge Co.
- Aluminum
  - Spielman Agencies Regd.
- Architectural Iron
  - Canadian Welding Works
  - Northern Architectural Iron Works
  - Canada Wire & Iron Goods Co
  - McGregor & McIntyre
  - Meldrum Iron Works Ltd.
- Air Hoists
  - Canadian Ingersoll-Rand Co.
  - Inglis Co., John
- Ash Hoists
  - Canada Link-Belt Co.
  - Jeffrey Manufacturing Co.
- Asphalt
  - Imperial Oil Company, Ltd.
- Beam Spans
  - Dominion Bridge Co., Ltd.
  - Hamilton Bridge Works Co.
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Blast Hole Drills
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Blast Gates
  - Canadian Blower & Forge Co.
- Block (Wire and Manila Rope)
  - Clyde Iron Works Sales Co.
  - Hopkins & Co., Ltd., F. H.
- Blowers and Compressors
  - Canadian Ingersoll Rand Co.
  - Canadian Blower and Forge Co.
- Bodies (Steel and Wood)
  - Wood Hydaulic Hoist & Body Co.
- Boilers
  - Canadian Ingersoll-Rand Co.
  - Engineering & Machine Works of Canada Ltd.
  - F. H. Hopkins & Co., Ltd.
  - Inglis Company, John
  - McGovern, T. J.
  - Mussens Limited
  - Waterous Engine Works Co.
- Boiler Inspection
  - Trades Labor Branch Dept. Public Works
- Boxes—Junction
  - Standard Underground Cable Co., of Canada Limited
- Box Rails
  - Midwest Canada, Limited
- Boxes (Valve)
  - Jenkins Bros. Ltd.
- Brick
  - Clayburn Company
  - Interprovincial Brick Co.
  - National Brick Co. of Laprairie
- Brick Dryers
  - Canadian Blower & Forge Co.
- Brick Machinery & Supplies
  - Hepburn, Ltd., John T.
- Bridges
  - Hamilton Bridge Works Co.
  - Standard Steel Construction Co.
- Bridges (Steel)
  - Canadian Des Moines Steel Co.
  - Dominion Bridge Co., Ltd.
  - Hamilton Bridge Works Co.
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
- Buckets
  - Canadian Austin Machinery
  - Link-Belt Limited
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Jeffrey Manufacturing Co.
  - Orton & Steinbrenner Co.
- Building Materials
  - Brantford Sand & Gravel Co.
  - Britnell, Limited
  - Brompton Lumber & Mfg. Co.
  - Doolittle Russell Ltd.
  - Oakley & Sons, Geo.
  - Link-Belt Limited
  - McCord & Co., S.
  - Muldoon Ltd., J.
  - Rogers Supply Co.
  - Ryan & Co., Frank
  - Vitrified Clay Pipe Publicity Bureau
- Building (Steel)
  - Standard Steel Construction Co.
- Cable
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Mussens Limited
  - Standard Underground Cable Co., of Canada Ltd.
- Cars—Steel Body
  - F. H. Hopkins & Co., Ltd.
  - MacKinnon Steel Company
  - Mussens Limited
- Cars—Freight
  - Canadian Equipment Co.
- Car Wheels
  - Canada Iron Foundries
  - Dominion Wheel & Foundries
- Carrier Systems
  - Jeffrey Manufacturing Co.
  - Link-Belt Limited
- Castings—Grey Iron
  - Canada Iron Foundries
  - Engineering & Machine Works of Canada Ltd.
  - Hepburn, Ltd., John T.
  - Inglis Co., John
- Cement
  - Britnell, Limited
  - Canada Cement Co.
  - Muldoon, Ltd., J.
- Cement Gun
  - Cement Gun Co.
  - F. H. Hopkins & Co., Ltd.
- Cement Hardener
  - Canada Cement Co.
  - Rogers Supply Co.
  - Spielman Agencies Regd.
- Cement Waterpruofing
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.
  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
- Centrifugal Pumps
  - Canadian Austin Machinery
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - F. H. Hopkins & Co., Ltd.
  - Inglis Co., John
  - London Concrete Machry. Co.
- Chains
  - Jeffrey Manufacturing Co.
  - Link-Belt Limited
- Chemists
  - Canadian Inspection & Testing Laboratories
- Chimneys
  - Horton Steel Works
  - Summerhays & Co., Wm.
  - Vitrified Clay Pipe Publicity Co., of Canada Ltd.
- Clamshell Buckets
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Orton & Steinbrenner Co.
- Coaches, Passenger
  - Canadian Equipment Co.
- Coal Crushers
  - Inglis Co., John
  - Orton & Steinbrenner Co.
- Coal Handling Apparatus
  - Canadian Austin Machinery
  - Canadian Mead-Morrison Co.
  - General Products Co.
  - Industrial Works
  - Inglis Co., John
  - Koehring Co., of Canada
  - Link-Belt Limited
  - Turnbull & Co., Harvard
- Concrete Block Machinery
  - London Concrete Machry. Co.
- Concrete Carts
  - Canadian Welding Works
  - F. H. Hopkins & Co., Ltd.
  - London Concrete Machry. Co.
- Concrete Culvert Pipes
  - Dominion Concrete Company
- Concrete Machinery
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Koehring Co., of Canada
  - London Concrete Machry. Co
  - Mussens Limited
  - Wettlaufer Bros.
- Concrete Mixers and Appliances
  - Canadian Austin Machinery
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - Mussens Limited
  - Turnbull & Co., Harvard
  - Wettlaufer Bros.
  - Williams Machinery Co., A. R.
- Concrete Hardner
  - Spielman Agencies Regd.
- Concrete Sewer Pipe
  - Dominion Concrete Company
- Concrete Tile
  - Winchester Cement Block & Tile Mfg. Co.
- Conduits
  - Conduits Company, Limited
  - National Conduit Company
  - Vitrified Clay Pipe Publicity Bureau
- Conduits (Wooden Pressure Creosoted
  - Pacific Coast Pipe Co.
- Contractors
  - Anglin-Norcross, Ltd.
  - Dinsmore, S. E.
  - Dickie Construction Co.
  - Gore, Nasmith & Storrie
  - Hill Bros.
  - Jackson-Lewis Co.
  - Kilmer & Barber
  - Lumsden Engineering & Transport Co.
  - Constructing & Paving Co.
  - MacKinnon Steel Co.
  - McLeod, Norman, Ltd.
  - Minogue Trucking Co., Ltd.
  - National Sand & Material Co.
  - O'Neil Co., Wm. N.
  - Chick Contracting Co.
  - Patterson Construction Co.
  - Pigott-Healy Construction Co.
  - Prack, Bernard H.
  - Provincial Contracting Co.
  - Russell Construction Co.
  - Ryan Contracting Co., E. J.
  - Scriven Construction Co., F. W.
  - Thomson Bros.
  - Witchall & Son
- Contractors' Bonds
  - United States Fidelity & Guaranty Company
- Contractors' Plant & Supplies
  - Fuller & Johnson Mfg. Co.
  - Bateman-Wilkinson
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Ingersoll Rand Co.
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Dake Engine Co.
  - Eastern Equipment Co.
  - Engineering & Machine Works of Canada Ltd.
  - Gartshore, John J.
  - General Products Co.
  - Hamilton Bridge Works Co.
  - F. H. Hopkins & Co., Ltd.
  - Hepburn, Ltd., John T.
  - Inglis Co., John
  - Koehring Co.. of Canada
  - Lamoreux Kelly Ltd.
  - London Concrete Machry. Co.
  - McGovern, T. J.
  - Mussens Limited
  - Orton & Steinbrenner Co.
  - Osgood Company
  - Scully, A. A.
  - Thew Shovel Co.
  - Turnbull & Co., Harvard
  - Webster & Trory
  - Williams Machinery Co., A. R.
- Conveying Appliances
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Inglis Co., John
  - Mussens Limited
- Core Drills
  - Canadian Ingersoll-Rand Co.
- Cranes (Crawling Traction)
  - Industrial Works
- Cranes, Travelling and Locomotive
  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Crane Limited
  - Dominion Bridge Co., Ltd.
  - Erie Steam Shovel Co
  - Hopkins & Co., Ltd., F. H.
  - Hepburn, Ltd., John T.
  - Industrial Works
  - Koehring Co., of Canada
  - Link-Belt Limited
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Creosote Oils
  - Britnell, Limited
  - Dom. Tar & Chemical Co., Ltd
- Crushed Stone and Granite
  - Canada Crushed Stone
  - Crushed Stone, Limited
  - Hagersville Crushed Stone Co.
  - Hagersville Quarries Ltd.
  - Muldoon, Ltd., J.
  - Rogers Supply Co.
  - Standard Lime Co.
- Crushers (Stone and Rock)
  - Canadian Ingersoll Rand Co.
  - Hopkins & Co., Ltd., F. H.
  - Inglis Co., John
  - Jeffrey Manufacturing Co.
  - London Concrete Machry. Co.
  - Mussens Limited
  - Rogers Supply Co.
- Cut Gears
  - Hamilton Gear & Machine Co.
- Cut Stone
  - Oakley & Sons, Geo.
  - Ritchie Cut Stone Co.
- Damp Proof Coating
  - Barrett Company, Ltd.
  - Imperial Oil Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd
- Derricks and Derrick Fittings
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Hepburn, Ltd., John T.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Turnbull & Co., Harvard
- Ditchers
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - F. H. Hopkins & Co., Ltd.
  - Mussens Limited
- Ditching Machines
  - Ball Engine Co.
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
  - Erie Steam Shovel Co.
  - Engineering & Machine Works of Canada Ltd.
  - F. H. Hopkins & Co., Ltd.
  - Mussens Limited
- Doors (High Grade)
  - Brompton Lumber & Mfg. Co.
  - Pannill Door Co.
  - Stewart, Robert
- Drag Line Excavators
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - F. H. Hopkins & Co., Ltd.
  - Koehring Co., of Canada
  - Mussens Limited
  - Orton & Steinbrenner Co.
- Dredging Pumps
  - Canadian Blower & Forge Co.
- Dredges
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
- Drills
  - Canadian Blower & Forge Co.
  - Canadian Ingersoll-Rand Co.
  - Hopkins & Co., Ltd., F. H.
- Duct Work
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Dust Blowers
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

(Continued on page 8)

Let's see—who uses the National Hand Fired Stoker?

You have been reading our National Hand Fired Stoker advertisements for some months past and you may be curious to know what concerns in Canada use it.

Here is a partial list:

Imperial Oil Co., Limited, Sarnia.

Muskoka Hospital for Consumptives.

Provincial Paper Mills, Georgetown.

Toronto Golf Club.

Toronto Hospital, Weston.

Midland High School.

Queen's University.

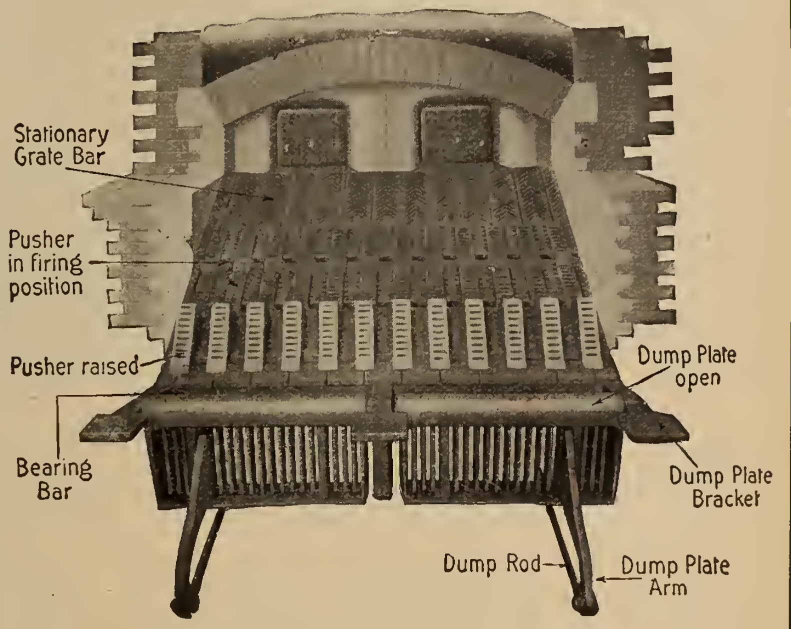
Cobourg Dyeing Co.

T. F. Shirley Co., St. Catharines.

Prince Edward Hotel, Windsor.

Culverhouse, Ltd., Vineland.

You are at liberty to write any of the above for their opinion of the value of the National Hand Fired Stoker. Booklet, price and full particulars sent on request. Remember, you can use the National under new or present Boilers.



View of National Hand Fired Stoker taken from back of fire box looking towards the furnace doors, which are closed. Successive sloping banks of the fire grates operated by pusher rods (not seen, because outside the furnace) are shown.

WHAT IT IS

The National Hand Fired Stoker consists of a system of downward sloping grate bars, fuel pushers, dump plates, boiler front, bridge wall and ignition arch. In firing all that it is necessary to do is to dump the fuel on the upper end of the grate and when this is coked it is moved a stage further down by means of pusher rods operated from the front of the furnace, and the fresh charge of fuel may be dumped in.

No need to spread the fuel—any "green" hand can thus do the firing. The successive pusher rods keep the fuel marching downward, ensuring perfect and smokeless combustion, until the lowest or dump grates are reached. The draft is evenly distributed throughout the fire bed and excellent results can be secured with waste and low grade fuels.

You get all the advantages on a smaller scale, and without the great cost of the large mechanical stokers.

We build Horizontal Return Tubular, Vertical Tubular, Locomotive Type and Marine Boilers. We construct Tanks, Penstocks and Steel Plate work of all kinds. We furnish gray iron and brass castings of any size in the rough or machined to order.

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices; Hall Machinery Co., Sherbrooke, Que., and Birks Bldg., Montreal

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Dump Bodies
Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co.

Dump Cars, Wheels, etc.
Canadian Equipment Co.
Dominion Bridge Co., Ltd.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Drying Apparatus
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Electric Fans
Canadian Blower & Forge Co.

Electrical Specialties
Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

Elevators
Link-Belt Limited
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roi Company
Lorne Tractors
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engineers (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.
Robinson & Co., Dwight P.

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Canadian Blower & Forge Co.

Exhaust Heads
Canadian Blower & Forge Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.

Fans, Multiblade
Canadian Blower & Forge Co.

Fans, Propeller
Canadian Blower & Forge Co.

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre

Fittings
Crane Limited

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Floor Clips
Western Steel Products Limited

Floor Stands
Jenkins Bros. Ltd.

Flooring Materials
Carmichael Ltd., A. W.
Imperial Oil Company, Ltd.
National Fireproofing Co.
Symmes & Co., H. H.
Vitrified Clay Pipe Publicity Bureau

Forges
Canadian Blower & Forge Co.

Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

Gasoline Engines
London Concrete Machry. Co.

Granite
Brodies Ltd.
Vancouver Granite Co.

Gravel
Allen Bros.
Brantford Sand & Gravel Co.
McCord & Co., S.
Rogers Supply Co.

Hammer Drills
Canadian Ingersoll-Rand Co.
Osborn Canada Limited, Samuel

Hardware
Hardware Co., of Toronto

Hardwood Flooring
Brompton Lumber & Mfg. Co.
Eaton & Sons, J. R.

Hauling Contractors
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited

Hoists, Electric
Canadian Austin Machinery
Link-Belt Limited
Clyde Iron Works Sales Co.

Hoists (Truck)
Wood Hydraulic Hoist & Body Co., Ltd.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
London Concrete Machry. Co.
Mussens Limited

Hoisting Engines
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Iron Work
Watson & Son, John

Jib Cranes (all kinds)
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
Dominion Bridge Co., Ltd.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Muldoon, Ltd., J.
Standard Lime Co.

Limestone
Deschambault Quarries

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Link-Belt Limited
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

Locomotive Steam
Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Motors
Lincoln Electric Co., of Canada Ltd.

Orange Peel Buckets
F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

Ornamental Iron
Canada Wire & Irons Goods Co.
Meldrum Iron Works Ltd.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Panels (Hardwood & Veneered)
Laminated Materials

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.

Vancouver Wood Pipe & Tank Company

Pencils((Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works
Greening Wire Co., B.

Pile Driving Machinery
Canadian Ingersoll-Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Co.

Pipe (Steel)
Canadian Des Moines Steel Co.
Dominion Bridge Co., Ltd.
Horton Steel Works
Inglis Co., John
National Equipment Company

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio. Limited
Windsor Plaster Co.

Plastering
Hynes Co., W. J.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.
Laurie & Lamb

Portable Loaders
Jeffrey Manufacturing Co.

Posts (Indicator)
Jenkins Bros. Ltd.

Power Engines
Inglis Co., John

Prisms
Luxfer Prism Co.

Pumps and Pumping Machinery
Babcock-Wilcox Goldie McCulloch
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Cook, A. D.
Fuller & Johnson Mfg. Co.
General Products Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Waterous Engine Works Co.

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The Painting of the T.T.C. Shops Was Entrusted to Us

The painting of the new T.T.C. Bathurst Street Shops called for a firm with a capable organization, experience on large jobs, and ability and resourcefulness to handle it while other work was in progress.

The contract was placed with us for the entire work of painting the interior and exterior, as well as kalsomining the basements. Rapid execution with our spray apparatus on ceiling, walls, radiators, and heating ducts, together with efficient methods of erecting scaffolds enabled us to do the work with a minimum of delay. An outstanding feature of the work was the painting of the saw tooth roof from specially prepared scaffolding, while the painting of the pipes was accomplished from staging built on trucks.

At it since 1880, and possessing facilities for all classes of work and of any size, we offer you our services as master painters, whether it be interior or exterior work that is required.

We have the staff, the equipment and the experience.

For your next building project, consult us on the painting

Some of Our Other Jobs—

The Canadian Aeroplanes Buildings, Dufferin St., Toronto.
The Out Bldg. of the Orthopedic. Hospital, Christie St., Toronto.
The Pantages Theatre, Toronto.
The Toronto Hunt Club Stables & Club House, Eglinton Ave. Toronto.
The St. Clair Car Houses & Offices, Toronto.
The Danforth Car Houses & Offices, Toronto.
The London & Western Trust Bldg., London, Ont.
The Champion Spark Plug Factory & Offices, Windsor, Ont.
12 Residences for Select Homes Corp., in Moore Park, Toronto.

BAVINGTON BROTHERS

2032 Dundas Street West **TORONTO**

"SAVE THE SURFACE AND YOU SAVE ALL" *Paint & Varnish*

WOOD | PLASTER | CONCRETE | MANUFACTURED PRODUCTS | METAL | BRICK

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Pump Valves
Jenkins Bros. Ltd.
Canadian Ingersoll-Rand Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Rails
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Sarnia Bridge Company

Road Asphalt
Imperial Oil Company, Ltd.

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Can. Fairbanks-Morse Co., Ltd.
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McGovern, T. J.
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Brantford Sand & Gravel Co.
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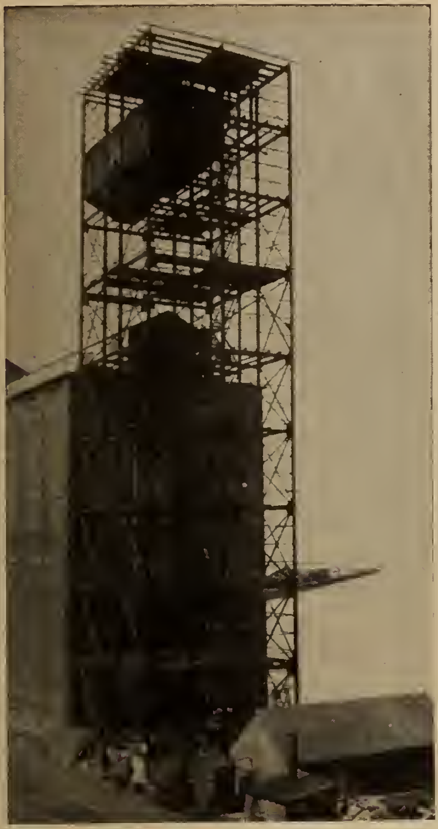

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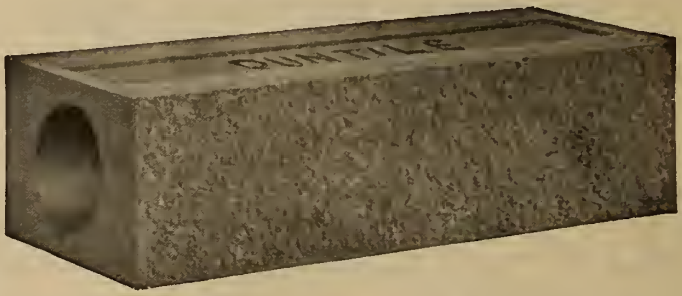

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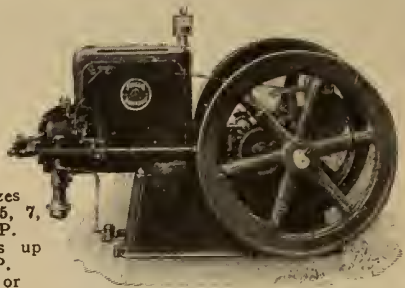

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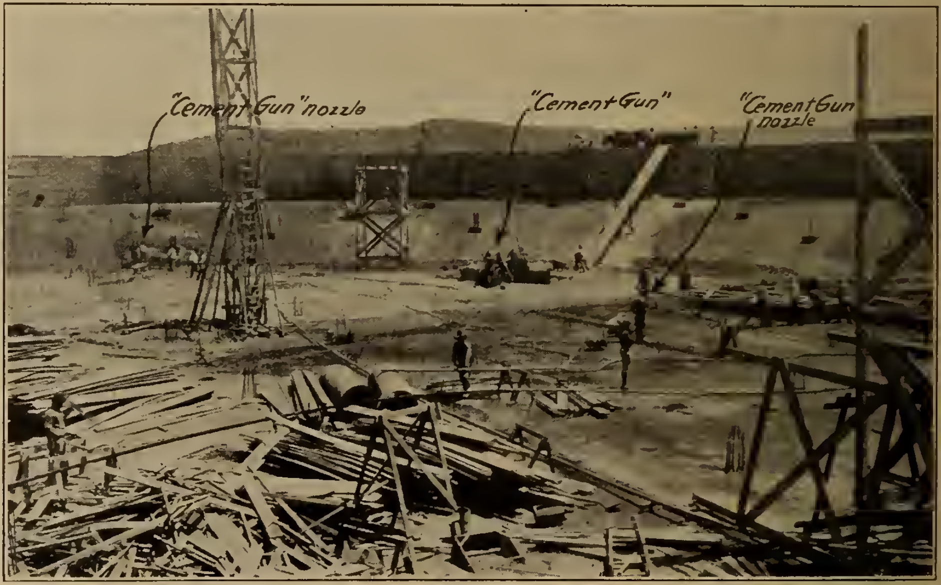

THE SPAVINAW PROJECT for the water supply of Tulsa, Oklahoma. Here we see the 10,000,000 gallon high-pressure reservoir being lined with "GUNITE", the sand and cement product of the "Cement-Gun". Note that the Gunite lining is being applied directly against the earth, while other work is in progress.

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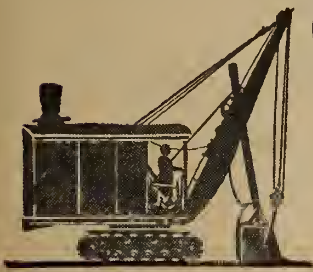

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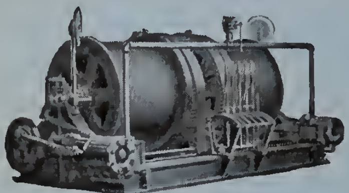
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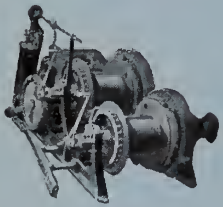
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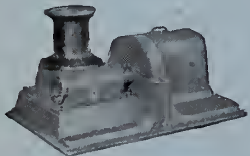
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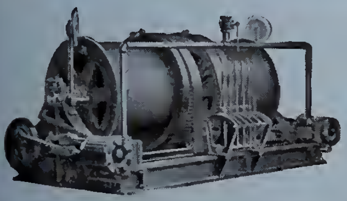
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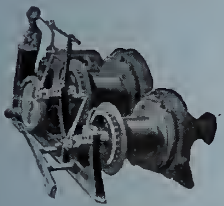
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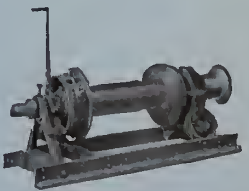
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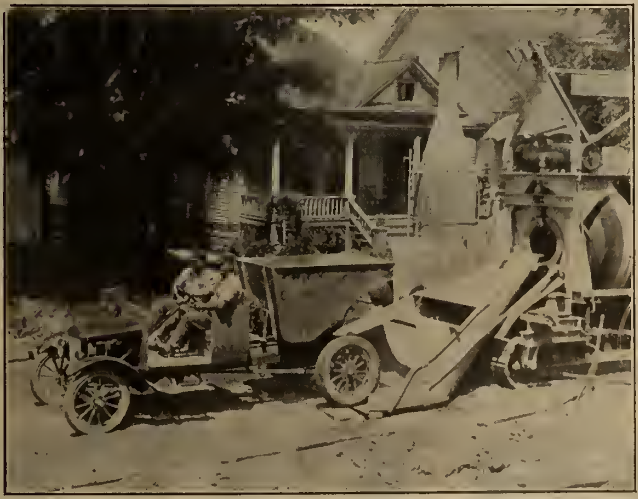

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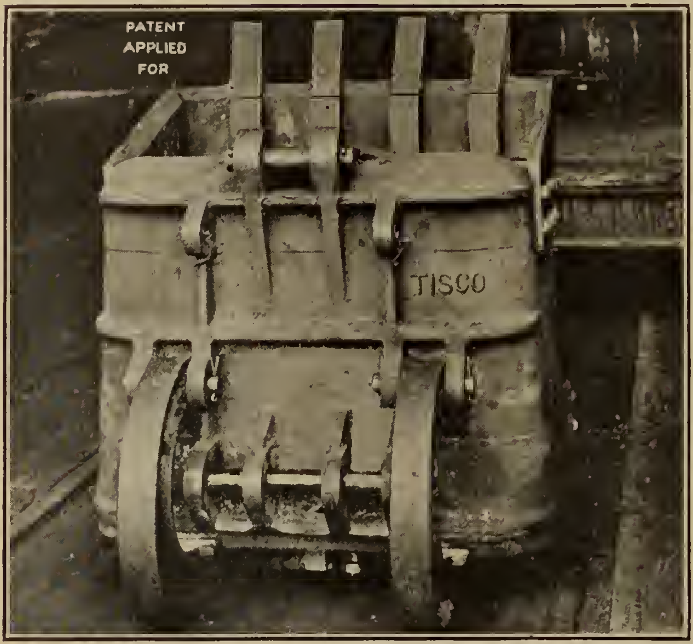

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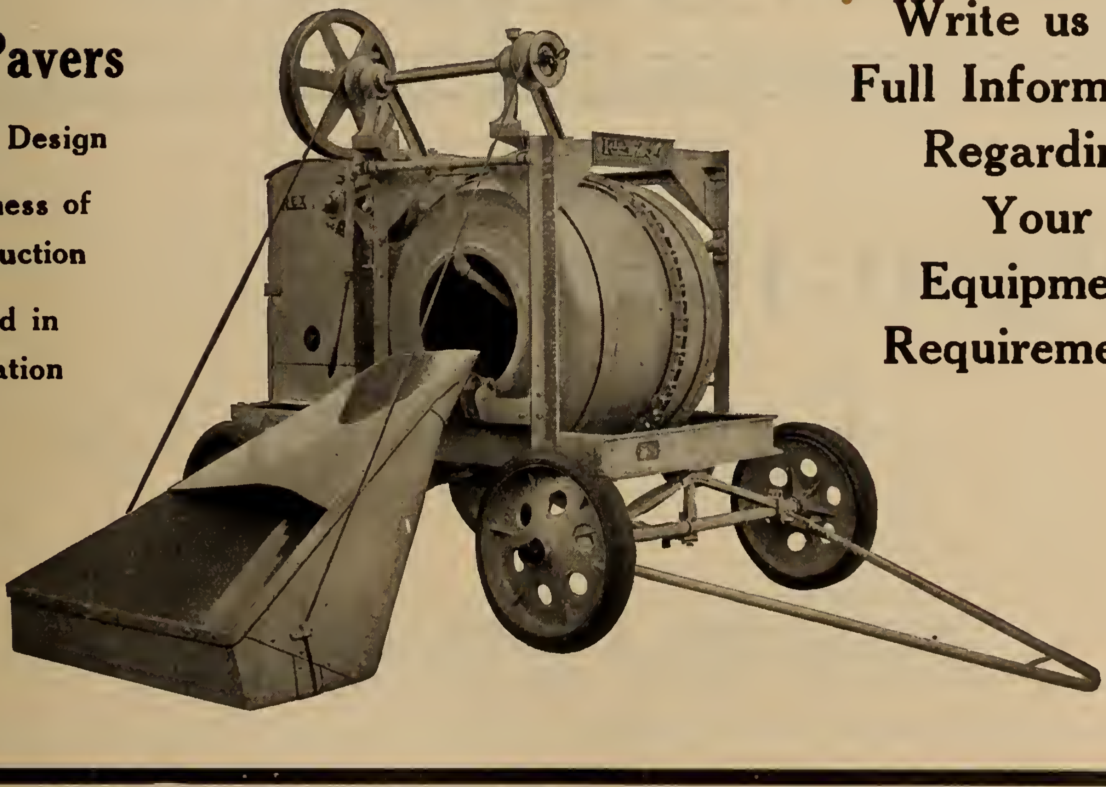

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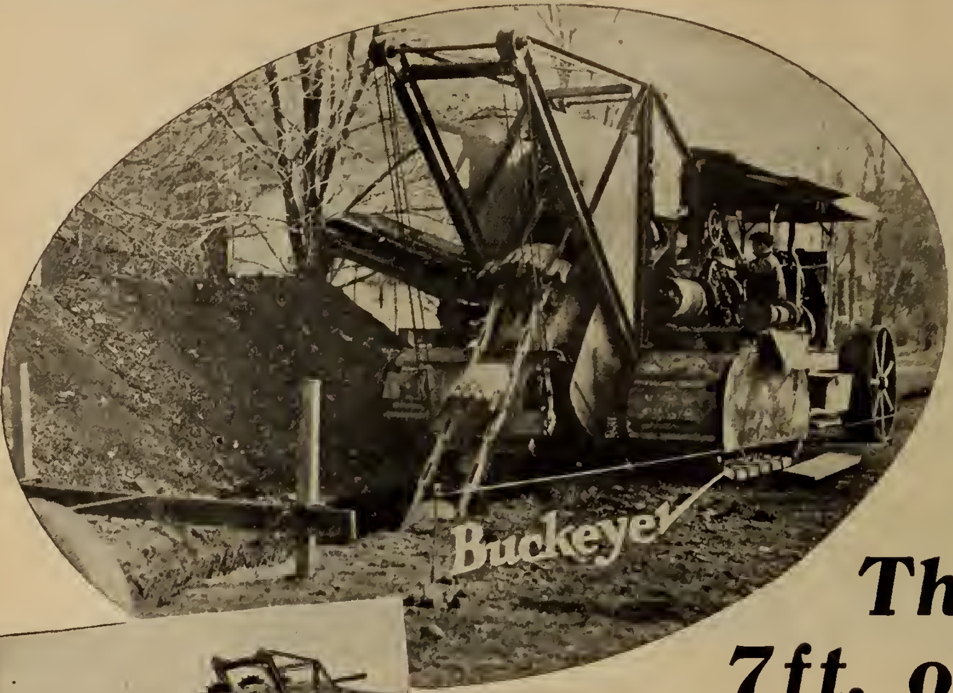

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"Dug trench 36 in. wide and 15 ft. deep, **with 7 ft. of it shale rock,** and **never blasted an inch,"** writes a Buckeye owner. About 650 yds. every 8 hours in digging like that—and Buckeyes "stand up to it." That means more profit for you. Add Buckeye's wide cutting range, with the Rotary Auxiliary cutter, and you've **one** machine that will cut almost any width trench and do more work than 70 men.

Instant Change of Delivery

The Buckeye Quick Shift Conveyor shoots the dirt out either side. Just turn the conveyor control wheel, and laugh at trees or other obstacles. Worth a lot when you **need** it—comes as standard on Buckeyes.

You'll Like This Back-Filler

Heavy duty motor, with **plenty of power.** All cables run free, with **no rubbing on sheaves.** Separate drive for each side for short, quick turns. Full length Alligator Traction. Send for the details, **today.**

Get the facts on Buckeyes and what they do. Mail the coupon. Take a minute now.

THE BUCKEYE TRACTION DITCHER CO.

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types) Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

FINDLAY, OHIO

Branch Sales and
Service Office:
J. W. Sands,
Chatham, Ontario

Sales Representative:
The General Supply Company
of Canada, Ltd.
85 Water Street
Winnipeg, Manitoba

John Birch & Co. Ltd.,
2 London Wall Buildings,
London, E. C. 2, England

Buckeye

The Buckeye Traction Ditcher Co., Findlay, Ohio.

I am going to buy a ☐ Trench Excavator.
☐ Back-Filler

Send me complete details on Buckeyes.

Name ....

Address ....

....

Continuous Sash in Typical Sawtooth Roof Frame—Ford Machine Shop—Ford, Ont.
This run is 540 feet long, which is the longest run of steel sash
in Canada ever operated from one power.

Truscon Steel Sash

USED IN

Ford Machine Shop—Ford, Ontario

This was the largest steel sash and mechanical operator contract ever awarded in Canada. Delivery was called for in three months from the signing of the contract and notwithstanding this fact complete delivery was made before the specified time. The contract which included erection has now been handed over to the owners who expressed themselves as being well satisfied with the material and service they received.

Our motto is "No job too big—no job too small"

Every order receives the best attention we can give.

Let us help you with your lighting and ventilation problems.

Trussed Concrete Steel Co. of Canada Ltd.
Walkerville, Ontario
Branches: Montreal Toronto Winnipeg Calgary Vancouver

Chamberlin Metal Weather Strip

The Standard Since 1893

The most up-to-date buildings to-day are Chamberlin equipped. We have a strip for every type of window, also special door equipment, for stone sills. Our strip fitted to windows, not only eliminates draught and dust, but saves its cost in fuel within a reasonable time. Guaranteed as long as the building stands. Estimates free.

Old or New Buildings

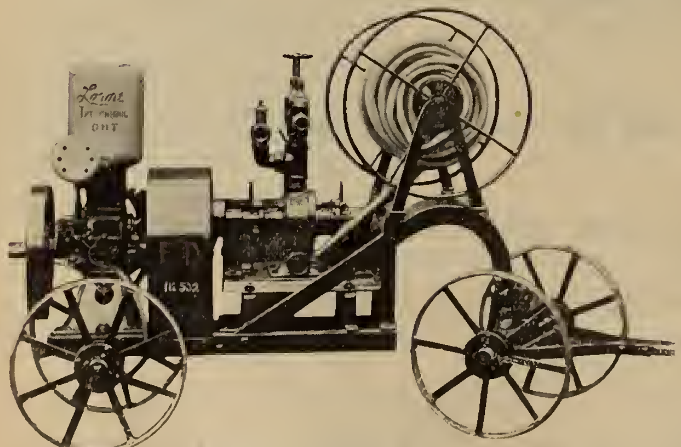
No special preparations needed either in old or new buildings for installing Chamberlin. This Company—through its different offices—takes the windows as they are, trues and refits them whenever necessary to insure perfect equipment.

Chamberlin Metal Weather Strip Agency of Toronto
Toronto Office — 546 Yonge Street
Phone Randolph 7140 **Factory: Kingsville, Ont.**

THE LORNE JUNIOR

GASOLINE FIRE ENGINE

Specially designed for use in small towns, villages, factories, outlying districts or farms



Lorne Junior Gasoline Fire Engine

The "Lorne" Junior, smallest of our line, is one of the most efficient pieces of fire-fighting equipment ever designed. It has the added advantage of being exceptionally low-priced. Any town, village, farm or factory can afford one—in fact the damage suffered in any ordinary fire would purchase a dozen such machines.

Water supply is taken from wells, cisterns, creeks, etc., and is delivered at high pressure from one or two nozzles.

Would you like more particulars? No obligation of course.

LORNE TRACTORS LTD. Tillsonburg, Ont.

NATCO HOLLOW TILE
FLAT ARCH CONSTRUCTION

General Accident
Assurance Company Building,
Toronto

Architect—F. S. Baker, F. R. I. B. A.
Contractors—W. M. Sutherland Co., Ltd.

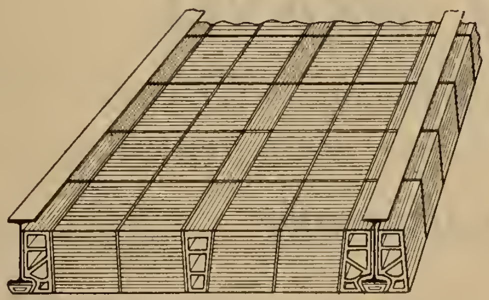
The Floor that saves Tons of Weight

Natco System of Flat Arch construction reduces dead loads, thereby effecting a large saving in the cost of structural steel and foundations.

It is common practice to complete Natco Flat Arch Floors on a schedule of one week following that used for the erection of the structural steel frame.

Time saved in construction is appreciated by Owners, who realize more prompt returns on their investments.

Data on request.



Typical NATCO Flat Arch

NATIONAL·FIRE·PROOFING·COMPANY
OF CANADA, LIMITED

Factory: HAMILTON -:- **Dominion Bank Building, TORONTO**

RECLAIMED LAND IS VALUABLE

Let Us Extend Your Water Front Lots

Going to Sea (S.S. Baxter Dick)

You can extend your waterfront lots with reclaimed land and vastly increase their value at a minimum outlay. Our efficient organization, completely equipped and backed by many years of experience will do the work for you in the shortest time. Equipment includes self-propelled sea dredges that will pump their load and return to make fill through pipe lines. Also self unloaders for sand and gravel that can unload in any lake or Atlantic port. Consult with our engineers.

SAND AND GRAVEL

We are the largest producers of Sand and Gravel in Canada, and can supply your requirements at short notice and at reasonable prices.

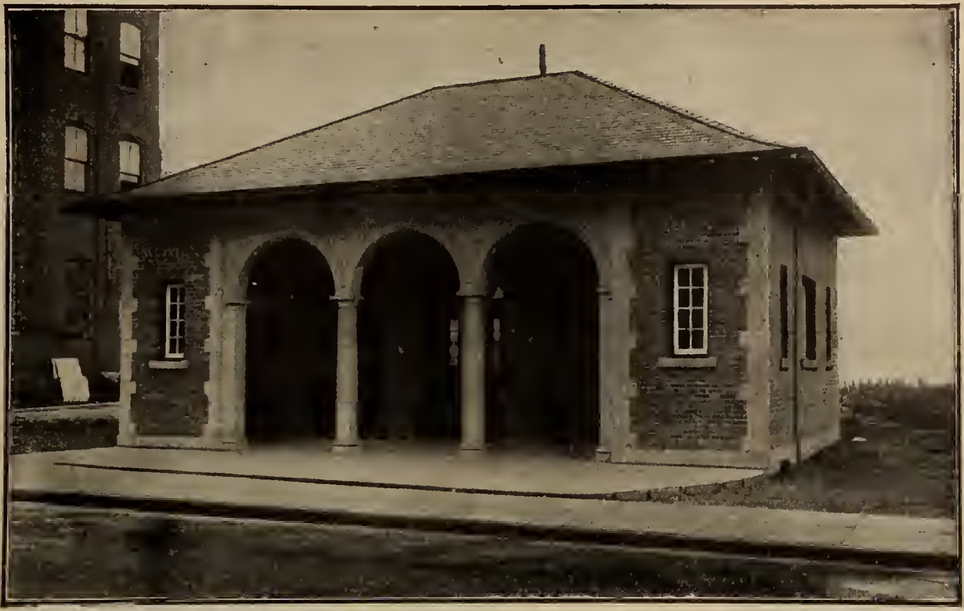
GET OUR QUOTATIONS

National Sand & Material Company Limited

D. DICK, Jr., President

WELLAND, ONTARIO

Largest Producers of Sand and Gravel in Canada *Telephone 108 Welland*



Public Comfort Station, City Hall Square, facing King Street East, Kitchener, Ont.

Public Comfort Station for Progressive Kitchener

Kitchener, one of Canada's busiest industrial centres, has taken its place with the leaders in public welfare work by constructing a handsome Comfort Station for the use of its citizens.

Designed by W. H. E. Schmalz and B. A. Jones of Kitchener, with Dunker Bros., also of Kitchener, as contractors, the Comfort Station is a particularly well constructed building.

The foundation is of concrete, guaranteeing solidity and permanence, while the walls are trimmed with Benedict (manufactured concrete) stone.

Retiring rooms for men and women are located on the right and left of the structure respectively, with the centre taken up as a Street Railway Waiting Room.

Necessities of this kind, simple of design and economical to build when concrete is used, should hold an important place on the improvement programme of every municipality.

Specify
CANADA CEMENT
Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary

HOW CONSTRUCTION COSTS CAN BE LOWERED

OSGOOD ¾-Yd. H.D. Tearing up Brick Pavement, Toledo, O.

Use an OSGOOD Steam Shovel. They will save you money because they work steadily at low upkeep and operation.
Can be mounted on either Continuous Treads or Traction wheels, and used as steam shovel, clamshell, dragline or crane.
See an OSGOOD before you buy.

¾—1—1¼ Cu. Yd. Steam Shovels,
Clamshells, Draglines, and Cranes.

The OSGOOD Company, Marion, Ohio, U. S. A.

**Made in Canada
Conduit**

**Electric Wiring
Made Safe**

XCELADUCT

Labelled under supervision of Underwriters Laboratories

(GALVANIZED)

**For All
Electrical
Installations**

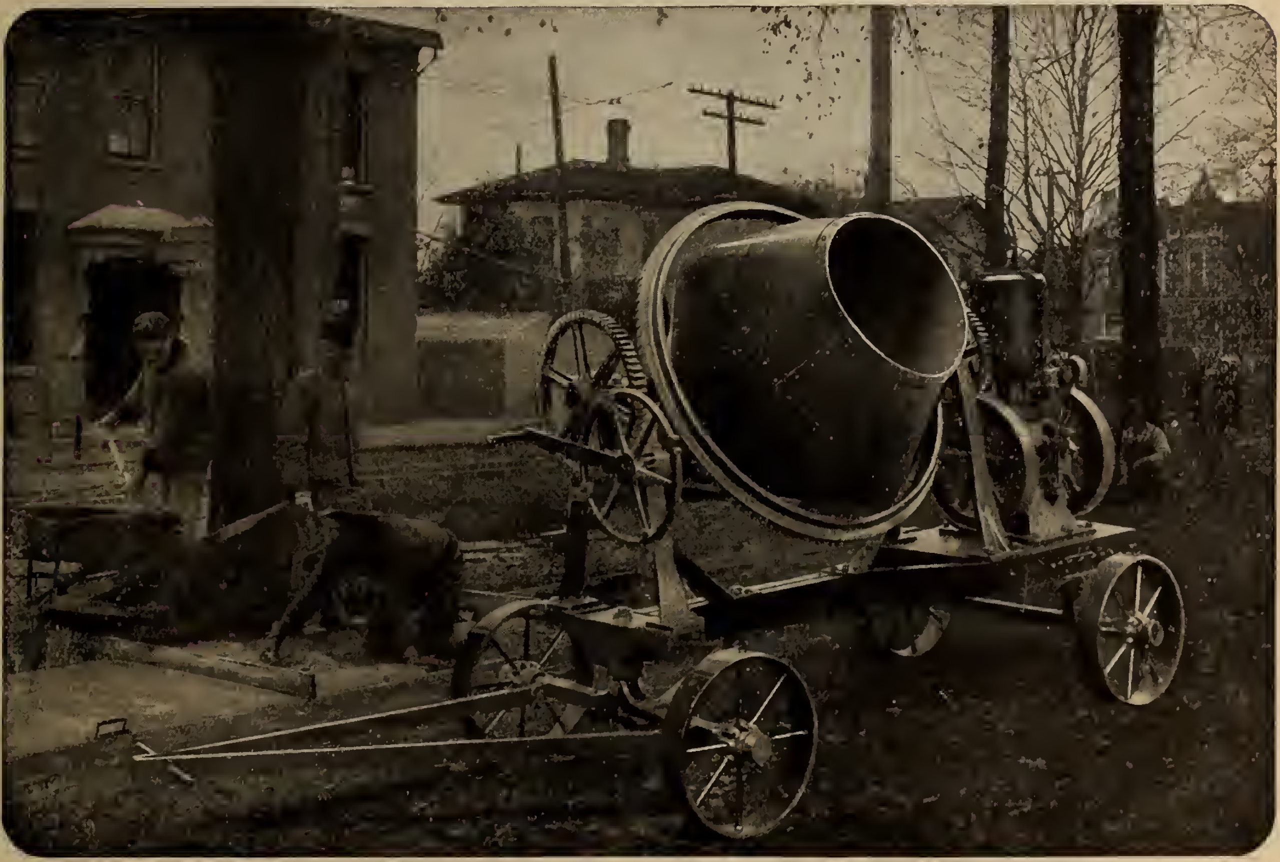
Manufactured by

National Conduit Co., Limited
Toronto

AUSTIN
MACHINERY
"MOVES THE EARTH—
MIXES THE CONCRETE"
TRADE MARK

The CUB-HEX

A LIGHT-TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX."

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

Provincial Sales Agents

Alberta: McAuley, Bell & Morris, Calgary.
B. C.: Dominion Commercial Co., Vancouver.
Man. and Sask.: J. L. Neilson, Co., Winnipeg.

Ontario: Dominion Industrial Products Co. Ltd., Toronto
Quebec: M. W. Davidson, Montreal.
Maritime: Frank A. Gillis Co., Halifax.

A TYPICAL INSTALLATION OF CRANE EQUIPMENT IN A FINE HOTEL WASHROOM

BUILDING LONG LIFE INTO EQUIPMENT

Matching the visible beauty of Crane sanitation fixtures is the assurance of lasting satisfaction guaranteed by sound principles in construction. Their design is guided by knowledge gained from sixty-seven years of experience and well directed research. Suitable materials are used and careful workmanship is applied in every manufacturing operation. Rigid inspections and tests imposed on all Crane equipment guard uniform quality. Crane valves, fittings and piping satisfy every requirement of the most elaborate sanitation, heating, water and vacuum systems now installed.

CRANE

CRANE LIMITED, GENERAL OFFICES: 386 BEAVER HALL SQUARE, MONTREAL
CRANE-BENNETT, LTD., HEAD OFFICE: 45-51 LEMAN STREET, LONDON, ENG.

Branches and Sales Offices in 21 Cities in Canada and British Isles
Works: Montreal, Canada, and Ipswich, England

Crane Low Pressure Globe Valve No. 1-B

Hauling 100 tons daily over the Sudan Desert

S. Pearson & Son, Ltd., of London, one of the largest contracting firms in the world, are building an enormous dam across the river Nile to provide a base water supply in the Sudan and are also building 650 miles of irrigation canals. In beginning this great project, the Engineering Department of S. Pearson & Son, Ltd. was confronted with the almost insurmountable task of transporting machinery, fuel and supplies under extreme difficulties of soil and climate, and in a country where roads do not exist

Various types of automotive and tractive machinery were tried out under expert supervision but all proved inadequate. **For a scheduled daily transportation of 100 tons over an average haul of eight miles, no solution of the problem was possible except by the use of "Caterpillar"* Tractors. Consequently, a fleet of 10-Tons was purchased for this important project.**

The unequaled performance of "Caterpillar" Tractors in hauling great cargoes in the military service of the Allied Governments throughout the war, is reflected by the selection of "Caterpillars" by one of England's foremost contracting firms, to accomplish work too difficult and too important to entrust to any other method or machine.

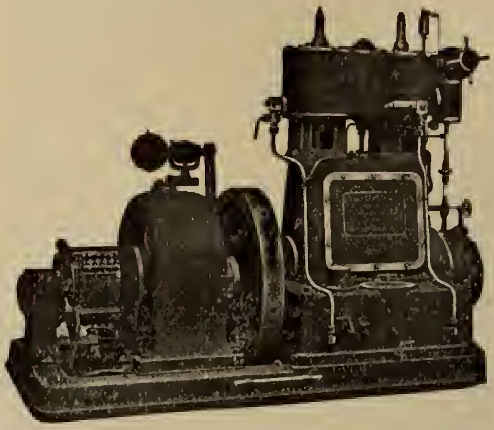
In every tongue, "Caterpillar" is a synonym for power, traction and economy. We invite correspondence from engineers, contractors, public officials and industrial firms in regard to any problems of overland hauling, dirt moving, snow removal or construction work.

**There is but one "Caterpillar"—Holt builds it*

CANADIAN HOLT COMPANY, LIMITED
468 Lagauchetiere St. W., Montreal, P Q.
Telephone Main 1589
WE MAINTAIN COMPLETE SERVICE STOCKS

CATERPILLAR
TRADE MARK
HOLT

Belliss & Morcom Ltd., Birmingham, England



Belliss Compound Engine and Generator

Cheap Power

In conjunction with Heating and Drying by Exhaust Steam.

Ask for latest pamphlet on savings effected by use of Exhaust Steam.

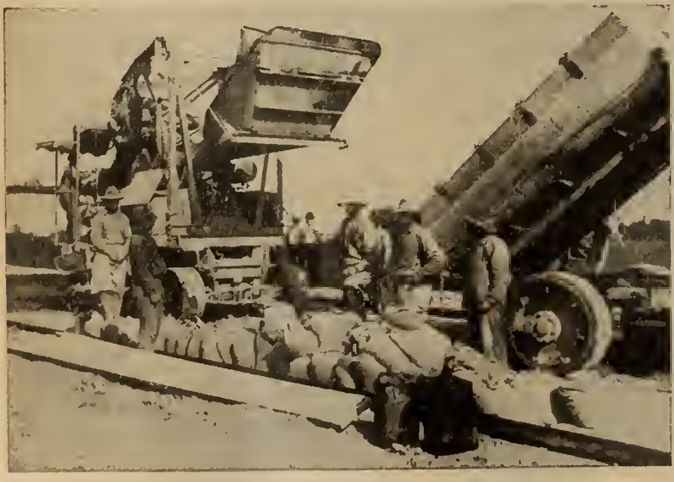
Agents—

LAURIE & LAMB, Board of Trade Bldg., MONTREAL

Applying modern methods to road paving

Those essentials necessary to the speedy and efficient completion of a road building job are an integral part of the Lumsden organization.

Our work during the present season furnishes ample proof of this. Let us give you full particulars.



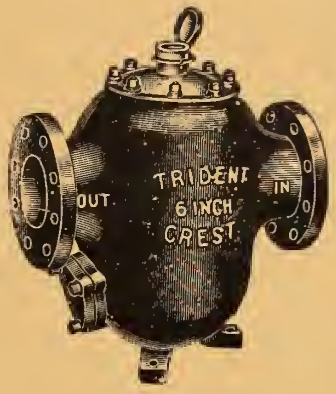
Lumsden equipment includes a fleet of trucks which may be rented singly or as unit.

Lumsden Engineering & Transport
Company Limited
1002 Lumsden Building
TORONTO, ONT.

NEPTUNE

The Pioneer of Progress

The Un-metered Service is a Burden on the Municipality!



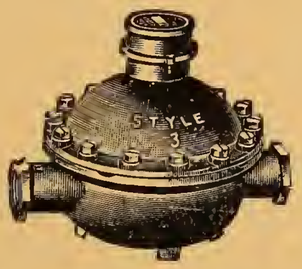
Most citizens believe that because their water supply is given them at cost, on a flat rate basis, that they are getting it as cheaply as possible.

The reverse is practically the case! True they are getting water at cost—but at maximum cost. Were the service metered, they would get it at minimum cost!

HOW DOES THIS WORK OUT?

Figures show that where a town used water on a flat rate basis, its consumption runs up to 40% more than is necessary. And, of course, the taxpayer has to pay for this enormous waste.

That is why the unmetered service is a burden on the municipality.



Neptune Meter Co. Limited

1197 King St. West, Toronto

Winnipeg, Man.
WALSH & CHARLES,
406 Tribune Bldg.,

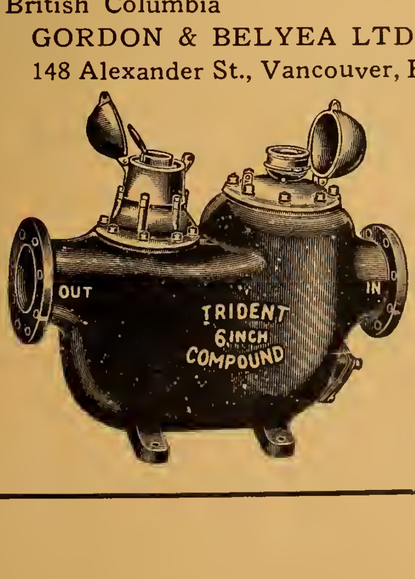
Maritime Provinces
JAMES ROBERTSON & CO.,
St. John, N.B.

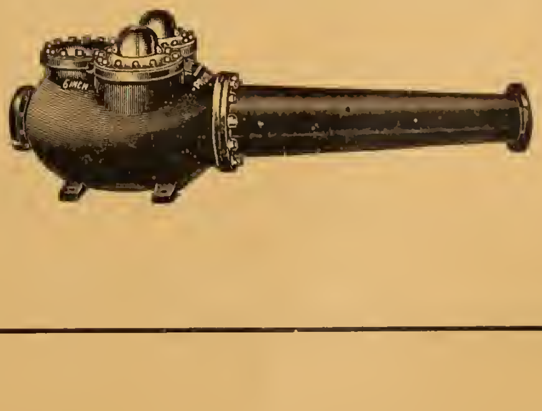
British Columbia
GORDON & BELYEA LTD.,
148 Alexander St., Vancouver, B.C.

The figures tell a graphic story of Trident progress

Year from 1893	Total Meters Sold
to 1900 incl.	85,773
" 1905 "	302,742
" 1910 "	742,663
" 1915 "	1,358 248
" 1923 (to Dec. 1)	2,577,000

A record such as this could not have been achieved without a product of unusual merit such as that found in Neptune Meters.





The Inevitable Choice of the Shrewdest Contractors!

More Proof of the

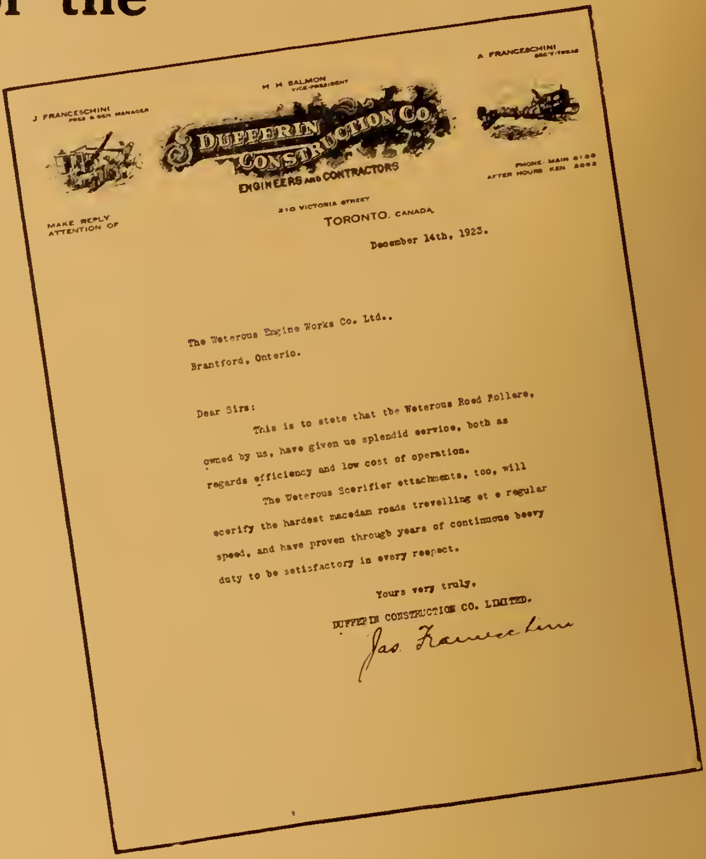
Efficiency and Economy

of

WATEROUS ROLLERS

The accompanying reproduction of a letter from the Dufferin Construction Co. Limited, is but a further addition to the mass of evidence testifying to the nation-wide preference of Waterous Steam Road Rollers with Scarifier attachment. The most progressive contractors in the country swear by them. They KNOW because they've PROVED it to their own satisfaction, that Waterous Rollers give them the highest degree of efficiency at the lowest operating and maintenance cost.

We'll gladly supply you with all the information you need. Write us now and be ready for the big road-building season when it opens up in the Spring.



J. FRANCESCHINI
PRES. & GEN. MANAGER

H. H. SALMON
VICE-PRESIDENT

A. FRANCESCHINI
SEC'Y-TREAS.

DUFFERIN CONSTRUCTION CO.
ENGINEERS AND CONTRACTORS

PHONE, MAIN [illegible]
AFTER HOURS KEN [illegible]

MAKE REPLY
ATTENTION OF

210 VICTORIA STREET
TORONTO, CANADA.

December 14th, 1923.

The Waterous Engine Works Co. Ltd.,
Brantford, Ontario.

Dear Sirs:

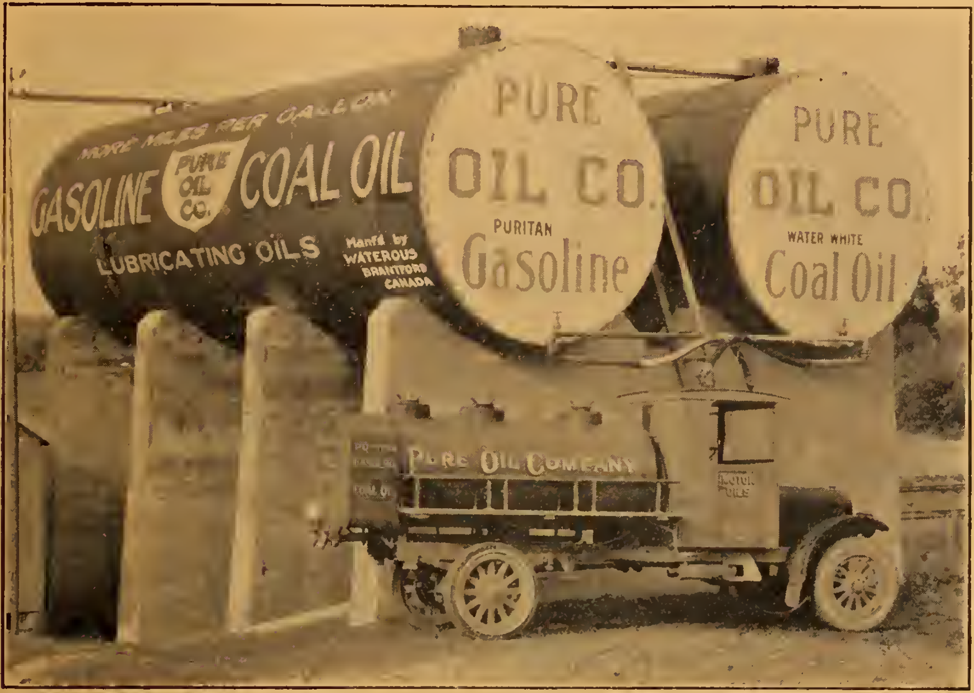
This is to state that the Waterous Road Rollers, owned by us, have given us splendid service, both as regards efficiency and low cost of operation.

The Waterous Scarifier attachments, too, will scarify the hardest macadam roads travelling at a regular speed, and have proven through years of continuous heavy duty to be satisfactory in every respect.

Yours very truly,
DUFFERIN CONSTRUCTION CO. LIMITED.
Jas. Franceschini

Waterous

BRANTFORD, ONTARIO, CANADA



Two 15,000 gal. rivetted tanks and one three compartment truck tank supplied by us to The Pure Oil Co., Brantford, Ont.

Tanks

For over thirty years we have been specializing in the fabricating of tanks (either welded or rivetted) and steel plate work of all kinds.

The accompanying illustration shows two of the many different styles of tanks we are manufacturing.

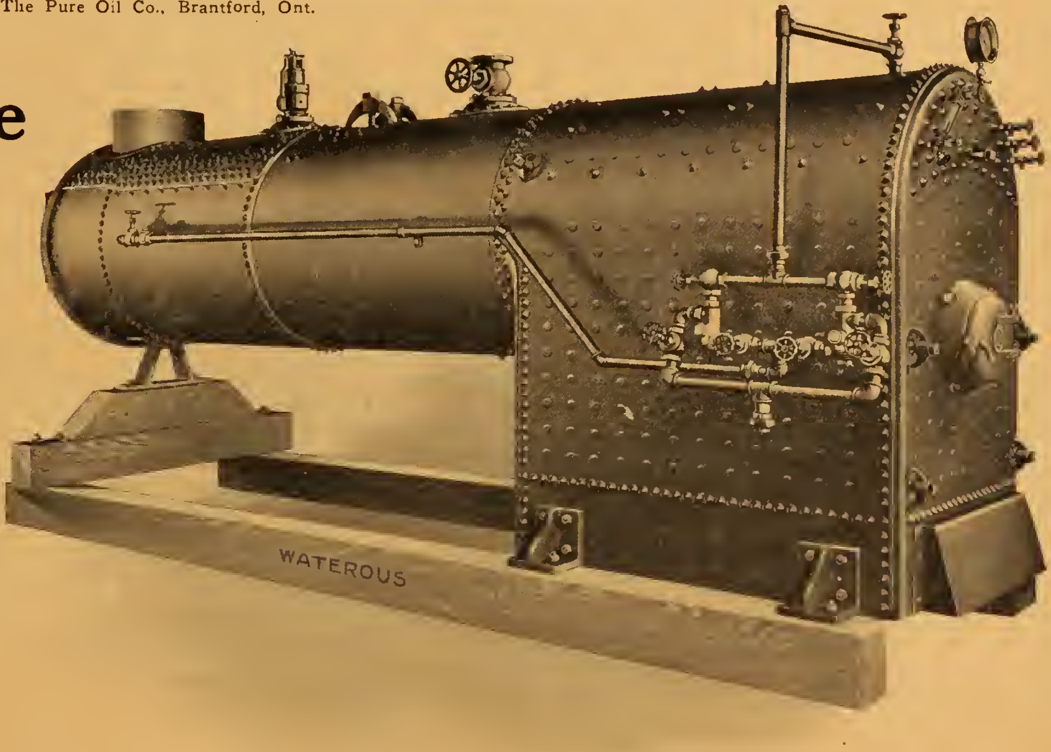
Our method of welding steel storage tanks is an absolute guarantee against leaking or breaking.

We build

Tanks (welded or rivetted), Steel Pipe, Elevators, Conveyors of all kinds. Steel Stocks, Steel Buckets, Dumping Skips, Screens, etc.

Locomotive Boilers

We carry large stocks of these boilers in all standard sizes ready for prompt shipment. They may be had on skids or steel wheels and can be used for excavation or cofferdam pumping for air compressor service and as an essential part of crusher outfits. All boilers are built to provincial regulations and under government supervision. They are quick, steady steamers and easily kept clean. Let us furnish you with particulars.



Waterous

BRANTFORD, ONTARIO, CANADA

Hunt Inspection means—

Consulting and
Inspecting Engineers,
Chemists and
Metallurgists

Expert inspection
and tests on all
materials and
equipment

the completest possible expert supervision service.

When you mark your orders subject to "Hunt Inspection" you have the absolute assurance that all materials purchased are up to specifications.

You prevent unnecessary loss through delays and misunderstandings.

***Let Us Demonstrate to
You the Real Value
of Our Services***

Robert W. Hunt & Co., Limited

Head Office and Laboratories McGill Bldg. Montreal

Branches throughout Canada, United States and Europe

The Foundation Company, Limited, is engaged in all lines of Engineering and General Building Construction. It is especially equipped for the rapid and economical construction of complete Hydro-Electric and Steam Power Plants. The Southern Canada Power Company, Limited, have awarded us the contract for the New 30,000 H.P. Hydro-Electric Development at Hemmings Falls, Drummondville, P. Q., under competition with the large Hydro-Electric Contractors on the North American Continent.

The following are a few of our Clients:

HYDRO-ELECTRIC POWER DEVELOPMENTS

Calgary Power Company,
Calgary, Alta.

City of Sherbrooke,
Weedon, P. Q.

Dominion Rubber Company Ltd.,
St. Jerome, P.Q.

Electric Reduction Company,
Buckingham, P.Q.

Lower St. Lawrence Power Company,
Metis, P. Q.

Maine & New Brunswick Electric Power Co.,
Tinker, N. B.

Michigan Northern Power Company,
Saut Ste. Marie, Mich.

Ottawa Railway, J. R. Booth & Bronson Co.,
Ottawa, Ont.

Penman's Limited,
Coaticook, P.Q.

Penman's Limited,
Paris, Ont.

Penman's Limited,
Port Dover, Ont.

Southern Canada Power Company Limited,
Drummondville, P. Q.

STEAM POWER STATIONS

Canadian Cottons Limited,
St. John, N. B.

Dominion Iron & Steel Company,
Sydney, N.S.

International Nickel Company,
Port Colborne, Ont.

THE FOUNDATION COMPANY LIMITED

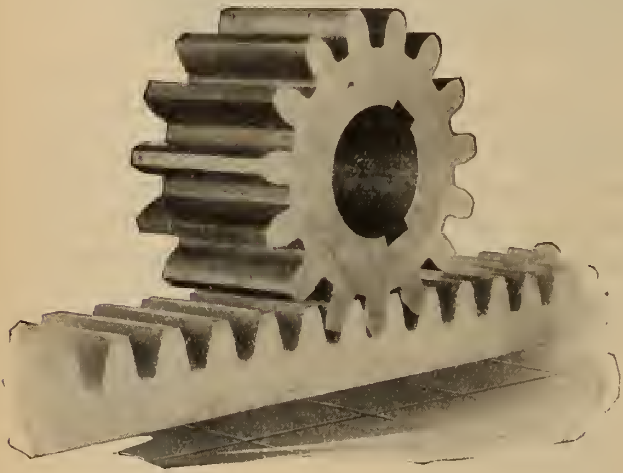
Engineers and Contractors
MONTREAL

Builders of SUPERSTRUCTURES as well as SUBSTRUCTURES

For
Cut Gears
of any Kind

CUT
GEARS

We Can Serve You
Well and Quickly



We publish Gear Engineering Data to help our Customers.

Ask us to put your name on the Data mailing list.

Write for Quotations

**Hamilton Gear
& Machine Co.**
76 Van Horne St., TORONTO

The Plant
Behind
Our Products

Is the largest, most modern and completely equipped in the country. - - - - -

It enables us to manufacture the very highest quality products at the lowest possible prices. - - - - -

Hardwood
Flooring

Laths, Lumber
Windows
Millwork
Kitchen Pantries

WE SPECIALIZE ON
MIXED CARLOADS

Let Us Quote on
Your Requirements

**Brompton Lumber
& MFG. CO.**
BROMPTONVILLE, QUEBEC

MUSSENS M LIMITED

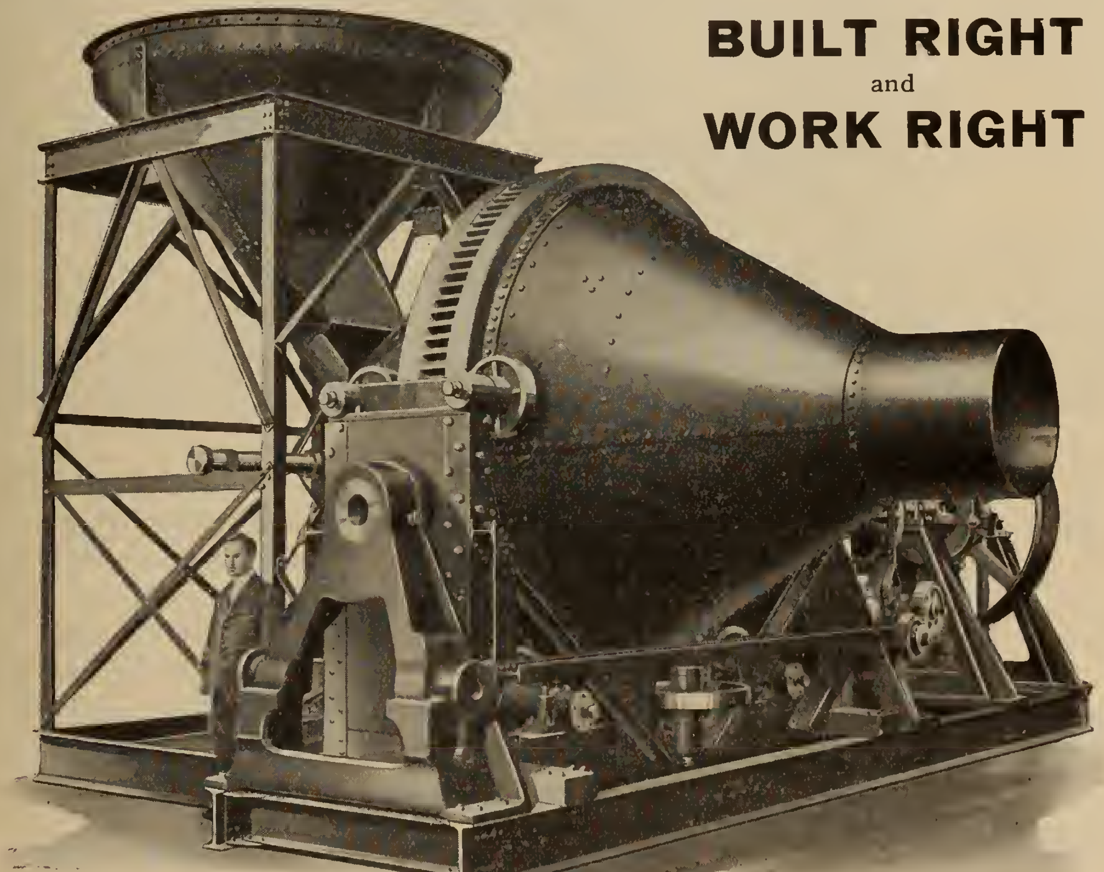
The Big Jobs Demand the Best—

There is too much at stake to take any chances—

That's why you see **SMITH MIXERS**

Working from coast to coast, because they can be depended upon to turn out the largest quantity of first-class concrete in the least time and without any delays—They are

BUILT RIGHT
and
WORK RIGHT



Send us your inquiries for all classes of Concrete Handling Equipment. Chutes, Towers, Buckets, etc., Derricks, Pumps, Hoists, etc.

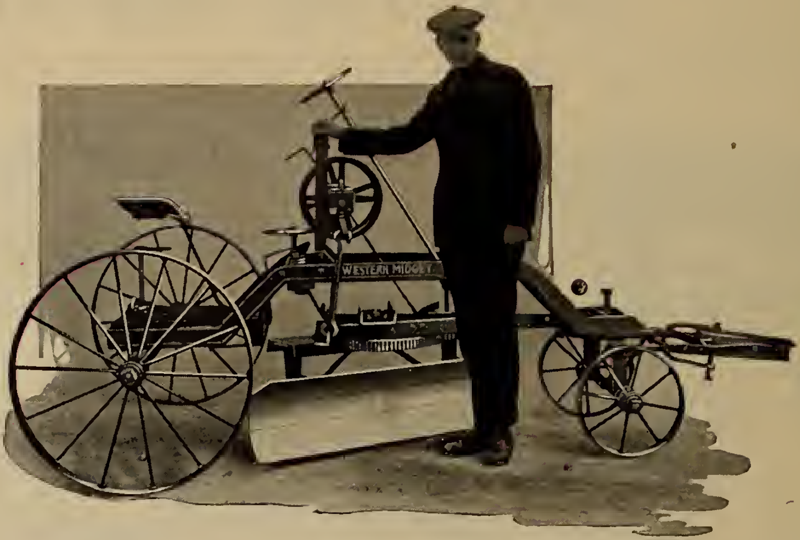
Bucyrus Shovels and Draglines Western Cars, Scrapers and Ploughs
Barber-Greene Bucket Loaders and Conveyors

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

Let the Midget Keep Your Roads in Shape



Here is a light road grader which we cannot recommend too highly—**the Western Midget.** It is a one-man, two-horse machine which has been used very successfully in Canada in the maintenance of earth roads. If your work is not heavy enough for the famous **Little Western Steel Grader** or the still larger grader of the well known Western type, you will find the **Midget** a most efficient tool to install.

One Midget grader properly used will keep a surprisingly large mileage of earth roads in excellent condition and at very low cost.

Western

That's Why

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

Stock carried at our warehouse at Toronto for the convenience of our customers

MUSSENS M LIMITED

"I wish to take this opportunity of telling you how satisfied I am with this Shovel"

Writes S. H. Stryker, of Stryker & Stryker,
Red Bank, New Jersey.

"We purchased [redacted] at the same time we bought the 20-B and up to date my expense for parts on the Bucyrus has been only \$3.40, while the cost of similar parts on [redacted] has been \$108.00 for the same period of time. As to the yardage of each respective shovel, can say that the Bucyrus can, and has done, at least $12\frac{1}{2}\%$ to 18% more yardage per day. Candidly the general condition and appearance of the Bucyrus is excellent after seven months' continuous work, never having been stopped a minute for any cause except weather."

THERE ARE REASONS Why 20-B Owners Feel This Way—Here Are a Few of Them:

BUCYRUS
Small Revolving Shovels are built in following sizes:
20-B—$\frac{3}{4}$-yard.
30-B—1, 1$\frac{1}{4}$-yard.
50-B—1$\frac{1}{4}$ to 2-yd.
Also as Draglines, Clamshell Excavators, Cranes, Etc.

SEND FOR BULLETIN
C-D
AND STATE WHICH SIZE YOU ARE INTERESTED IN

1. **The 20-B is Faster**— Its box girder-type boom and outside dipper sticks are lighter and stronger, and because of better balance, are easier to swing. Furthermore, the two-part hoist overhauls and hoists faster.
2. **The 20-B is Stronger**—Built to Bucyrus standards throughout—the underframe is of heavy structural steel, built around a big center casting, the most reliable construction known.
3. **The 20-B is Simpler to Operate**—An improved 3-lever control—a comfortable seat for the operator. Same lever for throttle and ram—load may be lowered with release throttle without foot brake.
4. **The 20-B has Better Caterpillars**—Less parts than any other built—stronger, longer life. A power steer operated from operator's seat or from ground.

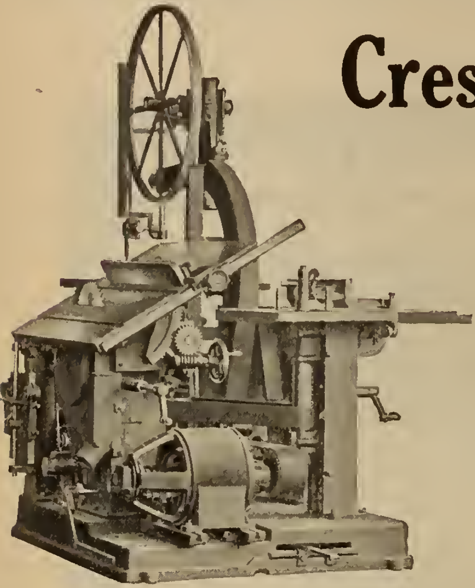
Your Trucks Move Faster Under a 20-B

BUCYRUS
Established in 1880
A Special Plant Devoted Exclusively to Small Revolving Shovels
Railroad Type and Revolving Shovels of all sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

538

Mussens Limited, Montreal, Que.—Toronto, Ont.
Dominion Equipment & Supply Co.
Winnipeg, Manitoba

You Need this Equipment



Crescent Universal Woodworker

Showing the New Model No. 107

The greatest little woodworker on the market. Has a wide range of capacity and is really five machines in one, consisting of Band Saw, Jointer, Saw Table with tilting top, Shaper and Borer. Each unit is provided with individual means for starting and stopping independent of others, yet all may be in operation at once. A thoroughly convenient, durable, time and money-saving piece of equipment that will give long years of dependable service.

You should investigate the merits of this efficient Woodworker.

The Beach No. 8 Combination Saw Table and Jointer

Has boring attachment and is mounted on extended skids. For use either with gasoline engine or electric motor. A handy efficient machine that may be used right on the job or in the workshop.

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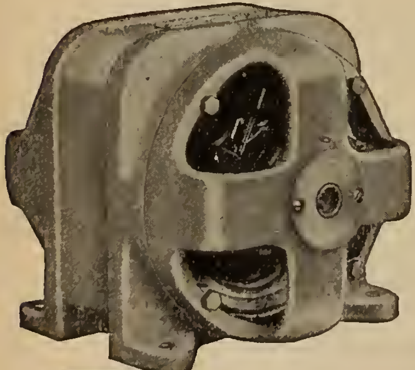

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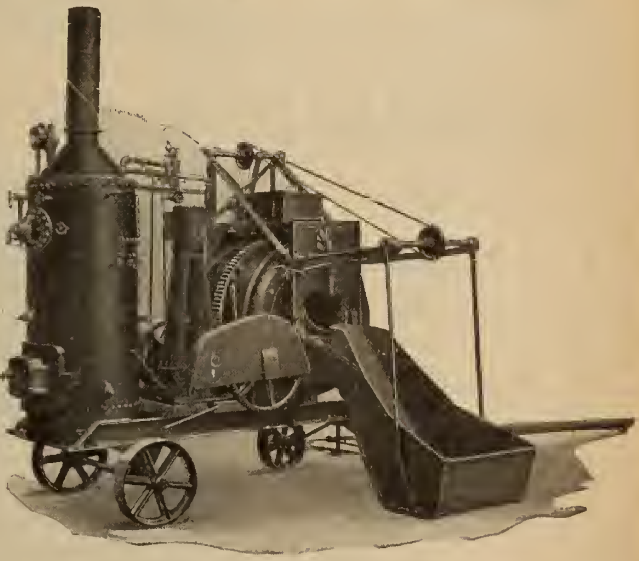

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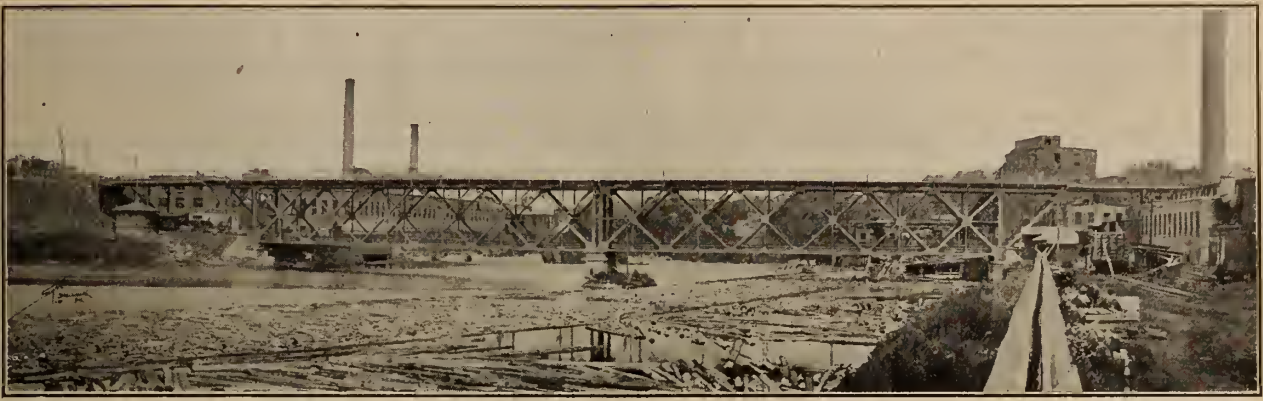

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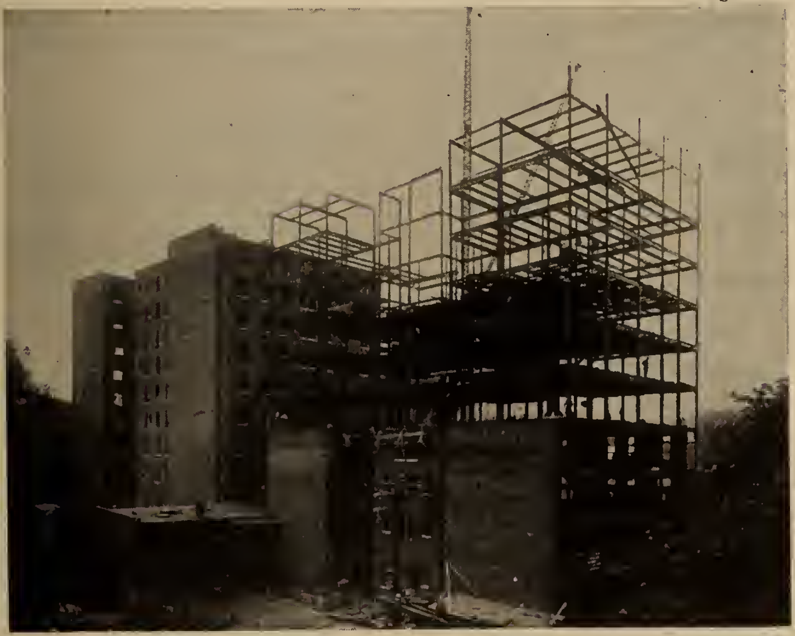

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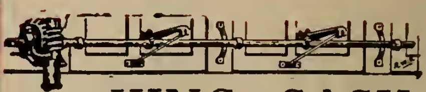

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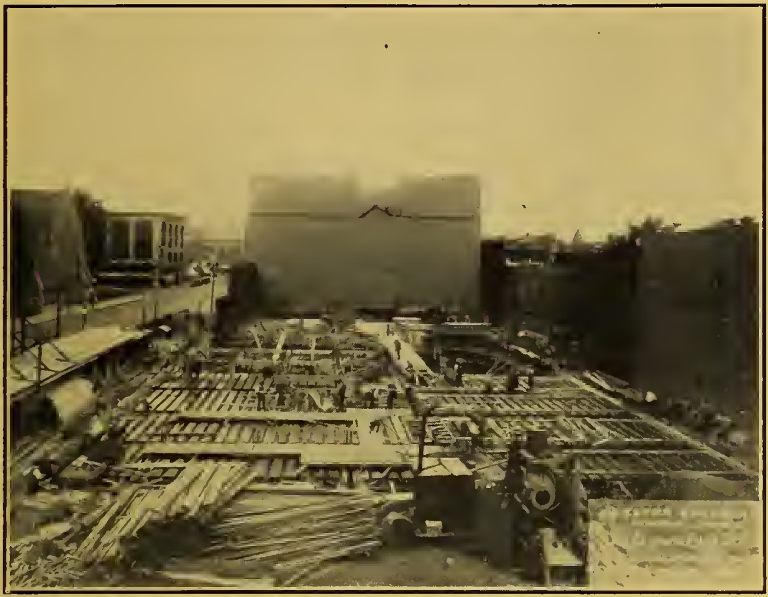

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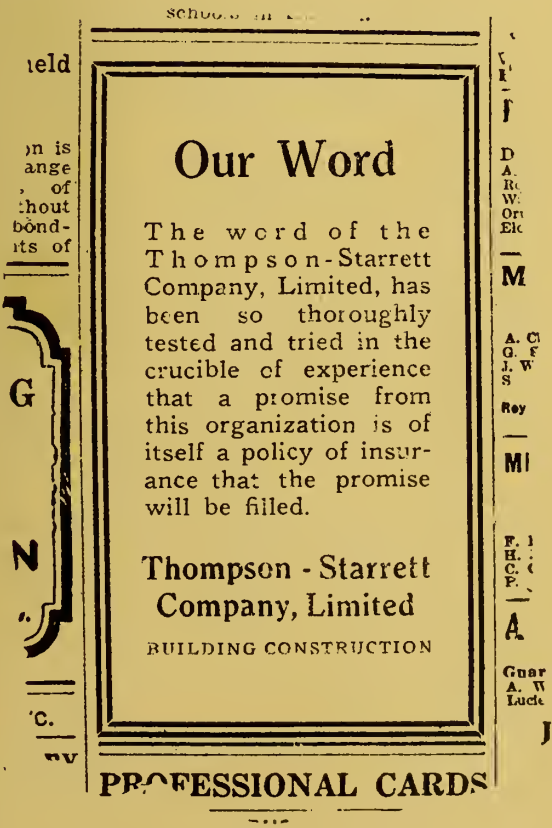

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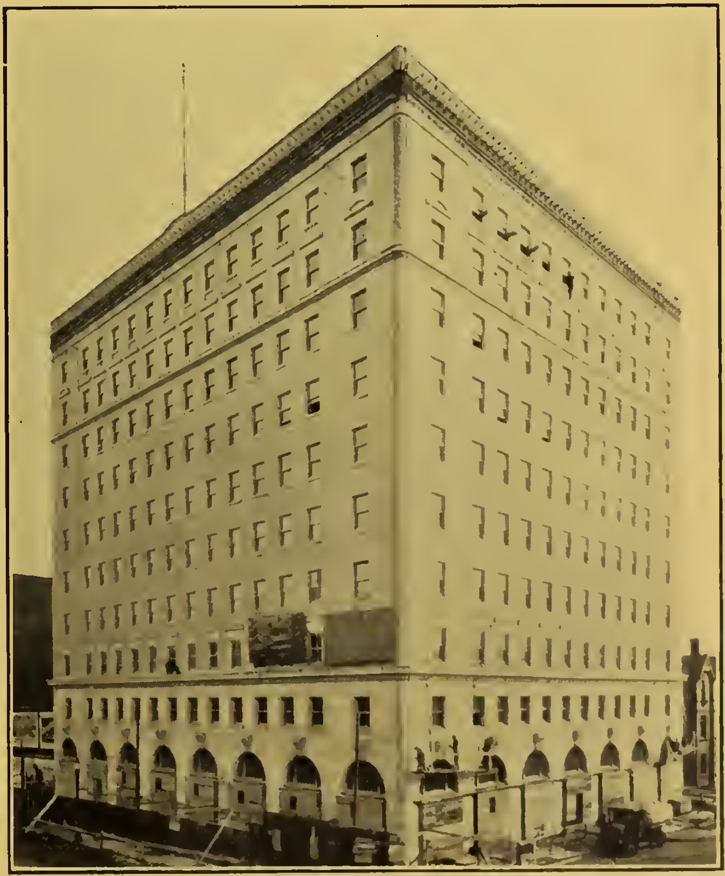

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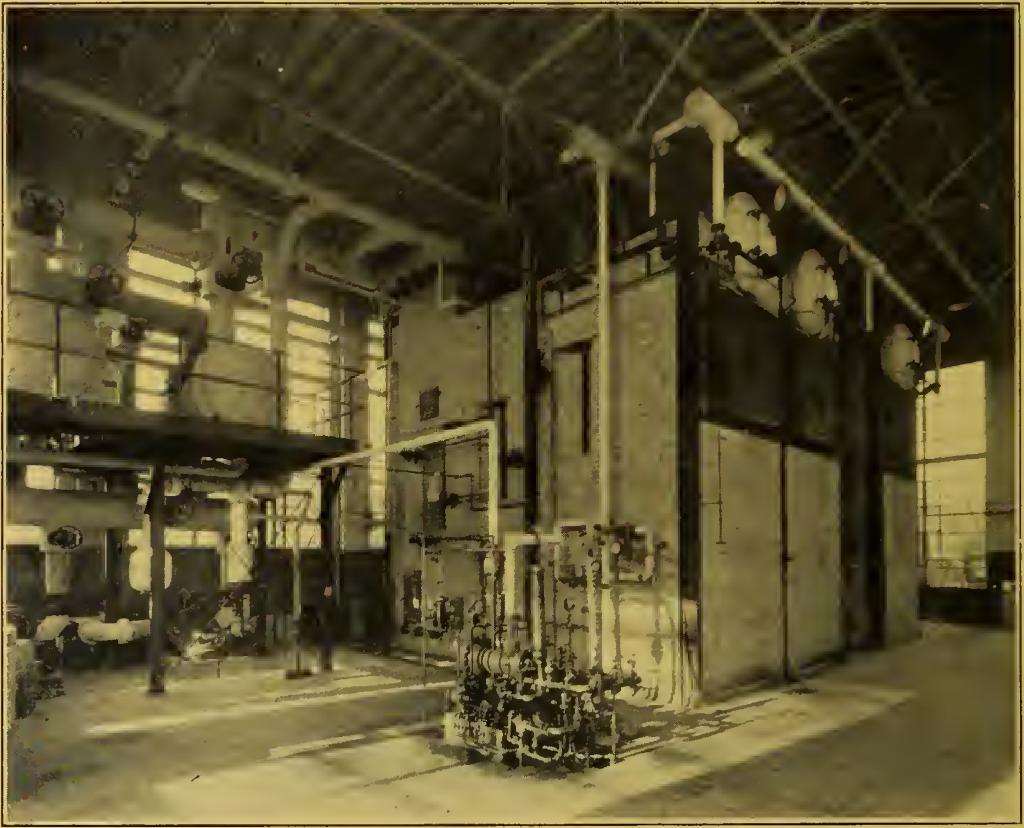

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MOVED BY ALDERMAN A. E. WILLARD,
SECONDED BY ALDERMAN J. A. HEAD.

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Motion carried
(Signed) J. A. McIRVINE, Mayor."

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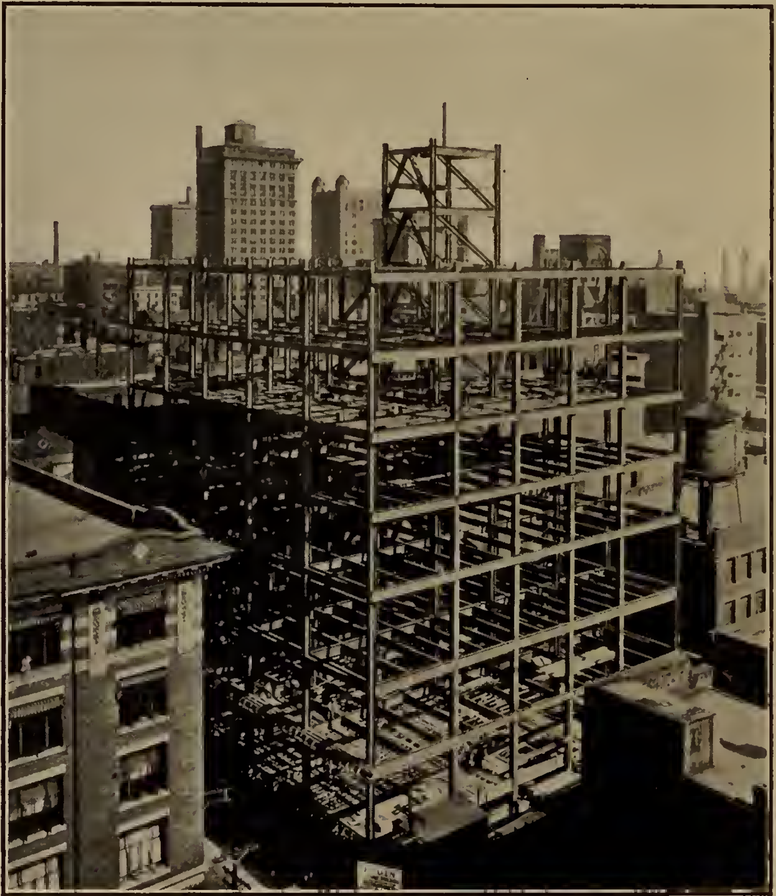
Loyola College	Montreal.	Educational
King Edward School	Montreal.	Educational
Catholic High School	Montreal.	Educational
Kitchener Collegiate	Kitchener.	Educational
Renfrew Collegiate	Renfrew.	Educational
Queen's University (Library)	Kingston	Educational
Bank of Montreal	Montreal.	Bank building
Merchants Bank	Toronto.	Bank building
Bank of Toronto	Toronto.	Bank building
Bank of British North America	Montreal.	Bank building
Canadian Bank of Commerce	Windsor.	Bank building
Canadian Bank of Commerce	Sherbrooke.	Bank building
Imperial Bank	Toronto.	Bank building
Royal Trust Building	Montreal.	Trust Building
National Trust Company	Montreal.	Trust Building
St. Denis Theatre	Montreal.	Theatre
Canadian Northern Terminal Station	Montreal.	Station
Children's Memorial Hospital	Montreal.	Hospital.
Chateau Frantenac	Quebec.	Hotel.
Royal Coliseum	Toronto.	Exhibition Bldg.
Sherwin-Williams Company	Montreal.	Flax Plant
Levis County Railway	Levis.	Car Barns.
Drummond Court Apartments.	Montreal.	Apartment Bldg.

Record of Performance is the Best Advertisement

The structural steel framework for the new Bell Telephone Co. Building, Toronto, is shown herewith. In the background of the illustration may be seen four of the largest buildings in the British Empire, the King Edward Hotel, the Royal Bank, the C. P. R. and Dominion Bank Buildings, all of which are monumental tributes to the world-wide record of structural steel.



BUILD WITH STRUCTURAL STEEL

Issued by the
Structural Steel Association

Elevated Steel Water Tank for the Ford Plant

In choosing the proper fire protection for the new Ford Plant a Canadian Des Moines Elevated Steel Tank was selected as the safest, surest and most economical solution of the problem. Safe and sure because the water is always ready, independent of the accidents which afflict any community's water works system. Economical, because the structure is reasonable in first cost, extremely low in upkeep and remarkably long-lived.

Your plant—is it adequately protected against fire? A Canadian Des Moines Tank will give the full protection you need and pay for its cost in a few years in reduced insurance rates alone!

Write to our nearest office for full details. Don't delay. Fire Protection is Vital.

CANADIAN TANKS DES MOINES
TRADE MARK

Canadian Des Moines Steel Co.
Limited

267 Inshes Avenue,
CHATHAM, ONT.

Dept. 67, 70 St. James St.
MONTREAL, QUE.

CANADIAN DES MOINES

Toronto's First Automatic Phone Exchange— Stone Work and Interior Marble by

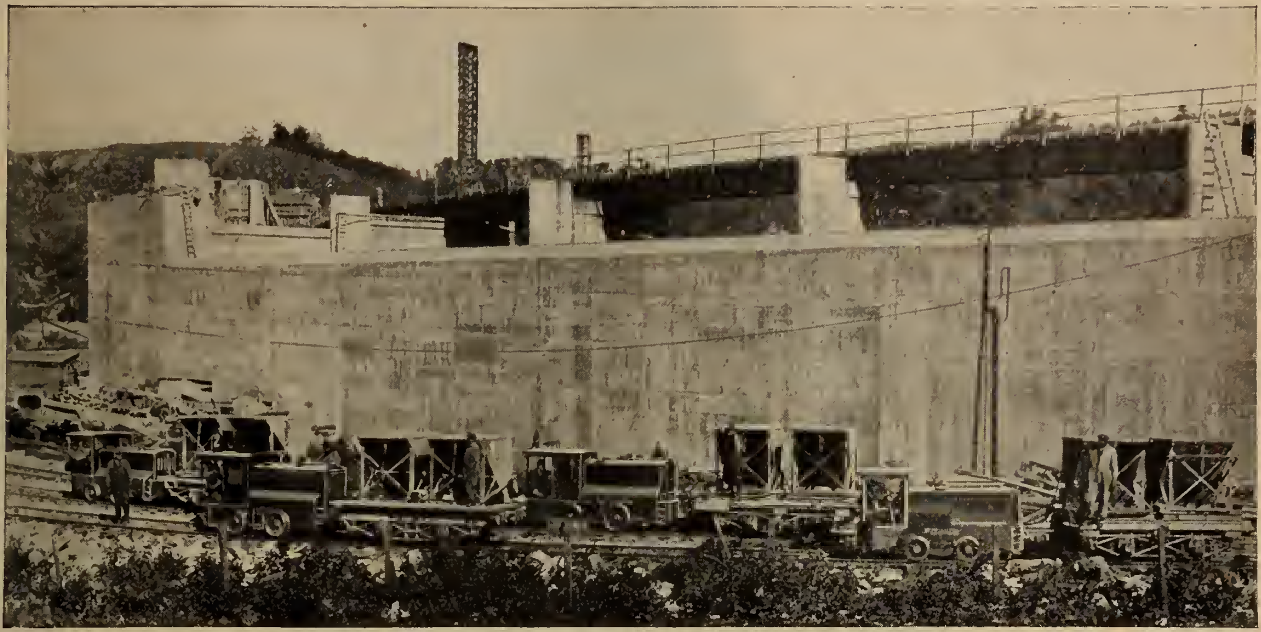
GEO. OAKLEY & SON
LIMITED

The erection of the Elgin Telephone Exchange, as the first unit of the new automatic system, has aroused more than local interest. The building itself is a handsome brick structure with cut stone trim. It is one of many prominent buildings recently erected in which the stone work was in charge of George Oakley & Son, Limited, and testifies to the results obtainable through close co-operation between the architects and ourselves.

Exceptionally complete facilities and an organization of highly-skilled workmen are at your service for any work you have in mind. Let us estimate on your marble or cut stone requirements.

Geo. Oakley & Son Ltd.

278 Booth Ave. Toronto



Plymouth Locomotives on La Gabelle Dam

One of the biggest fields awaiting development, and presenting the greatest opportunities to engineer and contractor today, is that of hydro-electric power.

In Quebec, one of the really big projects now under construction is known as the La Gabelle development.

An idea of the size and scope of the work may be gleaned from the data in adjoining panel.

Four 7-ton Plymouth Locomotives are used on this job, and in five months they travelled 10,000 miles, hauling over 100,000 cubic yards of concrete.

In big projects, as well as small, you will find Plymouth Locomotives doing their part in helping build a greater Canada. Ask for literature.

THE FATE-ROOT-HEATH CO., PLYMOUTH, OHIO. U.S.A.

Canadian Representatives:

F. H. Hopkins & Co. Ltd.,
Montreal and Toronto

Brown, Fraser & Co.,
Vancouver

The Powell Equipment Co.,
Winnipeg, Man.

Statistical

Name—La Gabelle Development.

Location—At La Gabelle, Quebec, about 10 miles north of City of Three Rivers.

Scope of Work—Construction of large dam and power house across St. Maurice River.

Excavation of solid rock ..150,000 yards.

Concrete to be poured ....175,000 yards.

Power House Equipment—Five complete units of 30,000 H.P. each.

Total installation ....150,000 H.P.

Power to be transmitted at 110,000 volts.

Turbines, high speed type, operating under 60 ft. head.

Owners—St. Maurice Power Co., owned and controlled by Shawinigan Water & Power Co. of Montreal.

Contractors—Shawinigan Engineering Co., a subsidiary of Shawinigan Water and Power Co.

Principal Cities to be served—Montreal and Quebec.

PLYMOUTH

Gasoline Locomotives

New Elgin Telephone Exchange, Toronto

Our Share

In This Important Achievement

FOUNDATION

We were called on by the Jackson, Lewis Co., who had the contract, for this vital part of the structure, to supply them with all the cement, stone and sand used in the foundation.

SUPERSTRUCTURE

All the cement, lime, (both hydrated and lump) and part of the stone were supplied by us to the James A. Wickett Company who had charge of the work.

SEWER PIPE
CEMENT
STONE
LIME
LATH

We shall be glad to Quote YOU
on any
Builders' Supplies
You are interested in.

FIRE BRICK
FIRE CLAY
SAND
GRAVEL
CRUSHED STONE

LET US DEMONSTRATE TO YOU THE VALUE OF OUR SERVICE

S. McCORD & CO., Limited

Head Office: 611 KING ST. EAST, TORONTO

Branch Yard: Woodbine Ave. & G.T.R. Tracks

When You Need

CRUSHED STONE SAND
BUILDING STONE
GRAVEL LIME CEMENT

Wholesale & Retail

Service as You Like It

Get in Touch With

Send in Your Orders

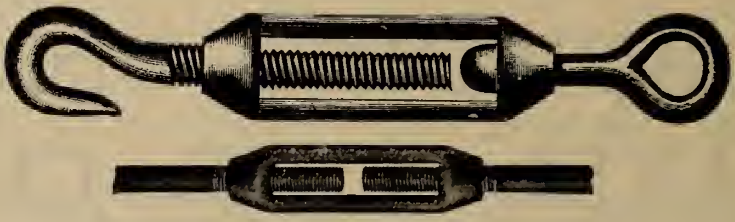
BRITNELL & COMPANY, LIMITED

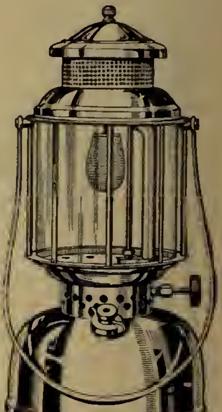
C.P.R. Crossing Yonge Street North Toronto

Day Phone, North 664 Night Phone, North 2107

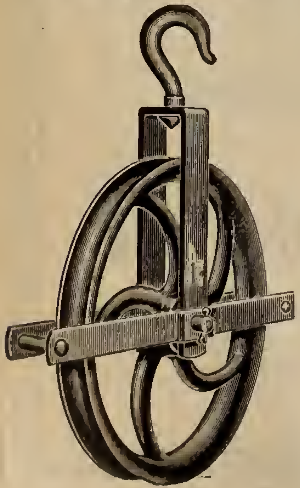
New Trinity College, Toronto

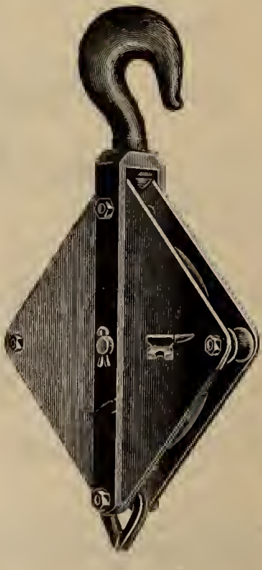
DICKIE CONSTRUCTION COMPANY LIMITED
RYRIE BLDG. *General Contractors* TORONTO

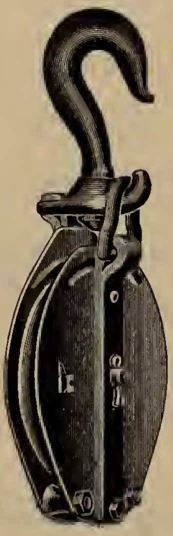




JNO. LECKIE LTD.,
77 WELLINGTON ST. W.,
TORONTO
Contractors
and
Engineers
Supplies
of all
kinds







PUDLO
Brand Powder

Makes Cement Work Bone Dry
All we want is your enquiry

We will do the rest—prove to you that PUDLO Brand Powder makes every form of concrete work watertight. Is not that all you wish to know?

Spielman Agencies Reg'd. 45 St., Alexander St. Montreal

Ottawa ...The Ottawa Fireproof Supply Co., 539 Sussex St.
Toronto ......C. W. Beal, 60½ Adelaide E.
Halifax ..R. R. Power, 311 Royal Bank Bldg.
Winnipeg, Edmonton, Calgary and Saskatoon............Winnipeg Paint & Glass Company Ltd.
London ..E. R. Seabrook & Co., 119 King St.
Quebec ....Pruneau & Co., 149 St. Pierre St.
Sault Ste Marie .N. G. Dehaas, 651 Queen St.
St. John, N. B. ....T. McAvity & Sons

Plastering Contractors
FOR THE
Lister Building, Hamilton

Some recent contracts executed by us:

Technical and Art School, Hamilton
Nurses Home, Hamilton
Prince of Wales School, Hamilton
Cannon St. School, Hamilton
Collegiate, St. Catharines
Collegiate, Guelph
Court House, Cayuga
Hydro Offices, Hamilton

HILL BROS. 53 Rosslyn Ave. North
HAMILTON

Phones: Gar. 459, Gar. 1921W, Gar. 3052M

GRAVEL
PLASTER
BRICK
SAND
CEMENT
STONE

On Time!

We feature a service that gets your supplies to you on time. There are no hold-ups, no delays, when you order from Muldoon. We will make quick delivery of car loads on all building materials to the required siding or direct to the site of job.

10 Trucks and 8 Teams
always at your service.

J. MULDOON, LIMITED
Lath
Builders' Supplies
Coal
SERVICE

J. MULDOON LIMITED
TORONTO
Head Office & Yards: 1613-1637 St. Clair Ave. W., Phone
Junct. 8621. Branch: Bloor and Perth Ave. Junct. 3625

BATES SYSTEM
OF BAR TYING
for
Reinforced Concrete Work

Save 2/3rds the time on concrete reinforcing jobs by using Bates Bar Ties and Tying Tools.

Three turns of the Bates Tool and the Bars are tied.

Write for circular covering prices, etc.

Bates Bar ties were used on the largest reinforced concrete jobs in the United States and Canada.

A large stock of bar ties all sizes carried in stock for immediate shipment.

Tying Concrete Reinforcing Bars with Bates bar ties and tying tool

BATES SYSTEM FOR FILLING & CLOSING BAGS

BATES VALVE BAG CO., LIMITED
Niagara Falls, Ont., Canada

ROBERT G. NOLL
Hamilton Ont., Canada

DRUMMOND & REEVES LTD.
Toronto, Ontario

MUSSENS LIMITED
Montreal, Winnipeg, Vancouver

Canadian Bank of Commerce Quebec, P. Q.

An Enduring Monument to Deschambault Limestone

Beauty AND **Endurance**

these two qualities
are inseparably linked in

Deschambault Limestone

The above illustration is but a typical example of the many beautiful buildings throughout the country which have been built with Deschambault Limestone. And it's not only the surface beauty that has made this product popular. It has proven to be impervious to the most rigorous climatic conditions.

Specify Deschambault Limestone on your next job. You'll add to your reputation and give your clients one hundred per cent service.

Deschambault Quarry Corporation

Head Office: Quebec, Que.
Works: St. Marc, Portneuf Co.

A view of Doolittle Russell's Yard, Hamilton, Ont. Equipped for Service!

SAND, STONE, CEMENT and other supplies for the outstanding construction jobs in Hamilton this season, were provided by **Doolittle Russell.**

Lister Building
(Contractor, Pigott-Healy Construction Co.)

Westinghouse Co.
(Contractor, W. H. Yates Construction Co.)

New Collegiate
(Contractor, W. H. Yates Construction Co.)

St. Ann's Catholic Church
(Contractor, W. H. Cooper)

Hamilton By-Product Coke Oven Co.,
(Contractor, Semet-Solvay Co., Syracuse, N.Y.

City of Hamilton
(All Sand and Stone Requirements)

The above list illustrates the FIRST YEAR'S PROGRESS of Doolittle Russell Limited. Our large stocks and up-to-date equipment enabled us to meet every requirement for these big contracts WITHOUT DELAY. Hundreds of smaller jobs, also, were given the same efficient service.

"We'll Keep Your Job Going" is a Slogan That Means Something!

DOOLITTLE RUSSELL

Phone Gar. 4010 **LIMITED**

Office and Yards—Gage Avenue North, Hamilton

Prompt Service on Your Supplies

- CEMENT
- CRUSHED STONE
- LIME
- PLASTER
- SAND
- GRAVEL
- MEDUSA CEMENT
- MORTAR COLORS
- WEEPING TILE
- SEWER PIPE

Materials Supplied on These Jobs—

New City Dairy Bldg.
Car Barns, Roncesvalles Ave.
New Reception Hospital
4 Bldgs.—Transportation Com.
Hillcrest Yard
Pickard Bldg., Church St.
Public Library, Gerrard St.
Civic Incinerator.
Cutten & Foster addition.
Trunk Sewer, Roncesvalles Ave.
Canada Bread addition
Bradshaw Waxed Paper Plant
and many other jobs.

Our Complete Organization Ready to Serve You

We have every facility for giving you a fast and efficient service on your building supplies. Our delivery system and yard equipment is modern and complete, including seven trucks, forty horses, travelling cranes, etc. Rush orders get immediate attention.

Get our prices on the next lot you need.

FRANK RYAN & COMPANY

1327 BLOOR ST. W. **Phone Ken. 0543** **TORONTO**
North Toronto Branch—Merton Street—Phone Hudson 0742

Column Spiral Concrete Reinforcing for

LISTER BUILDING, HAMILTON
DRUMMOND COURTS, MONTREAL
GOWAN'S KENT BUILDING, TORONTO

— AND —

Floor Reinforcing for

TORONTO TRANSPORTATION COMMISSION BLDG.

Were Supplied by

FROST STEEL & WIRE Co. Ltd.

Hamilton, Ontario

We have installed Special Machinery for doing this work, and can give quick delivery and perfect material

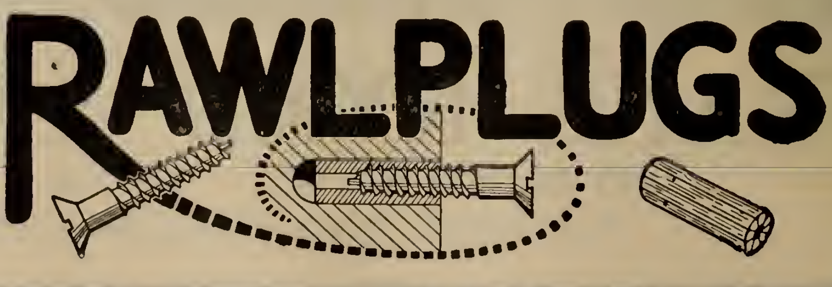
Rawlplugs solve one of your most troublesome problems

How to make an ordinary wood screw hold in plaster, stone, concrete, tile, etc., is one of those problems you probably encounter every day. Why not settle it once and for all by the use of RAWLPLUGS?

RAWLPLUGS never pull out or fracture the material. They are the most efficient device for their purpose ever employed.

INVENTIONS LIMITED
Sole Agents for
RAWLPLUG CO. OF CANADA
Southam Bldg., Bleury St., Montreal

Sales Agents
Dominion Engineering Agency, Ltd., 24 Adelaide St. E., Toronto
Sterling Specialties, 213 Somerset Bldg., Winnipeg, Man.
William Riley, North West Bldg., Vancouver, B.C.
Blackadar & Stevens, 139 Roy Building, Halifax, N.S.
H. G. Evans, 58 Water Street, St. John, N.B.



Helping to Build Business for Frank Ryan & Co.

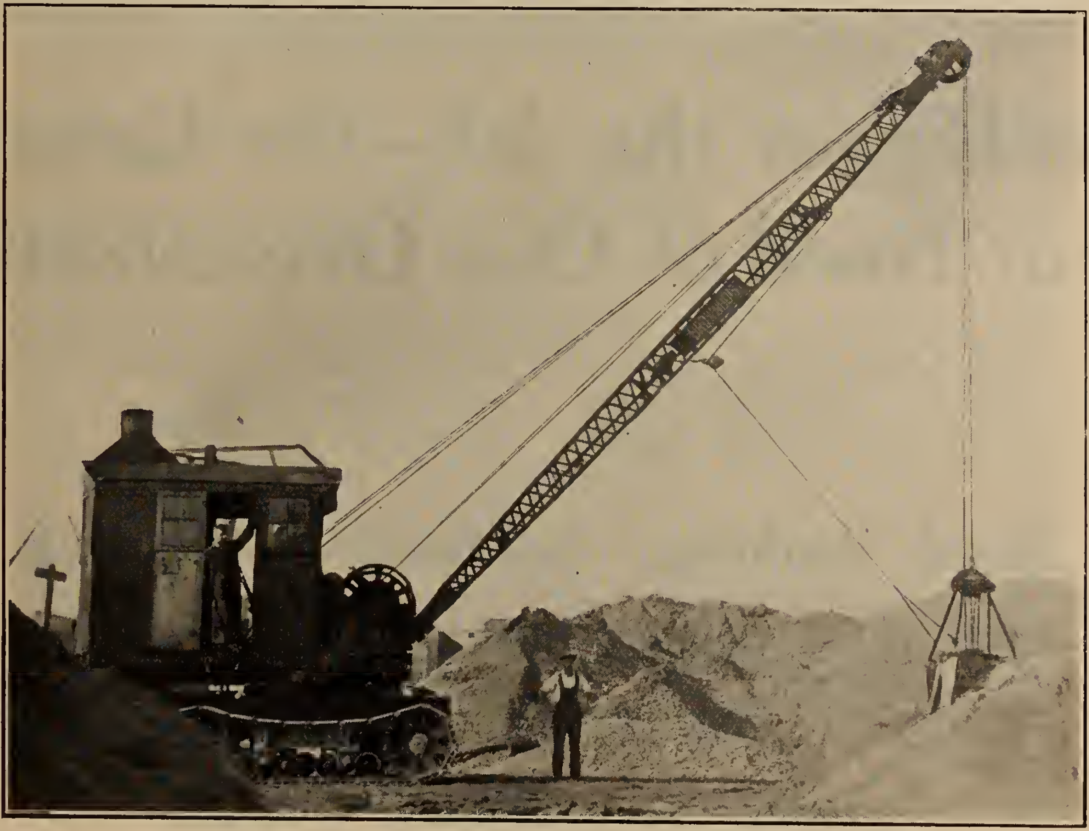
It can do the same for You

When Frank Ryan & Co., Toronto decided upon a rearrangement of their main yard, it was with the idea of giving better service.

Part of the plan was the purchase of a Brownhoist crane, clamshell bucket and bins. An average of ten cars of material per day is handled by this one Brownhoist. Thus the journey from car-to-stock-pile-or-bin-to-delivery-truck-to-job is a continuous one. There are no delays.

As Mr. Ryan says: "Careful attention to the requirements and desires of our customers has built up our business. Prompt deliveries and other service features are important incidentals in making this policy effective. By adhering to a service principle we have established a good-will that is one of our most valuable assets.

Perhaps the above story contains a lesson for you. If you believe it does we'll gladly give you full information about the Brownhoist crane or any other of the Brownhoist Products.



THE BROWN HOISTING MACHINERY CO., Cleveland, O.

Branches: New York, Chicago, Pittsburgh, San Francisco, New Orleans, London, England

BROWNHOIST

MATERIAL HANDLING MACHINERY

Our Asphalt Plant located at Tansley on the Toronto-Hamilton (Dundas) Highway

The Bigger the Job—the Greater Your Need of Our Organization

The above shows a typical scene taken from our road building programme this year. It is but one of the many important jobs on which we have been engaged during the past twelve months, and will give you some little idea as to the extent of our facilities and the kind of work we are capable of producing.

We shall be glad to have you consult us on any job dealing with

Road Building, Excavating, Grading and General Construction Work

No matter how large or small the job our extensive experience, complete facilities and large organization are at your service.

Contractors' Equipment to Rent

We have a complete rental service and can place at your disposal up-to-date and reliable equipment on the shortest possible notice. Steam Shovels, Road Rollers, Trucks, Hoists, etc.—if it's anything in contractors' equipment, we have it.

SEND US YOUR ENQUIRIES

DUFFERIN CONSTRUCTION CO., LTD.

JAMES FRANCESCHINI, President

210 Victoria Street - - - Toronto

Here it is!

The Largest
and Best Equipped Plant
In Ontario

The daily output of this modern plant is 3500 tons of clean-cut stone, made in all desired sizes for every purpose and every size uniform and of even grade.

With this tremendous capacity and our unique shipping facilities we can give you unequalled service.

Let Us Quote You on Your Requirements

CANADA CRUSHED STONE CORPORATION LIMITED

Dundas — Ontario

Exclusive Agents: John E. Russell Co. Ltd., Phone Adel. 1600

Facts for the Dealer who has to be shown

1922

1915

1910

1900

1896

GROWTH OF THE GYPSUM INDUSTRY

Trace Gypsum's growth in the building industry—what do you find? A product, at first unknown, struggling for recognition against hidebound tradition, petty prejudices, and the attacks of the lath-and-plaster interests; meeting with objections from almost every quarter—and overcoming them; then convincing a few of the further-sighted members of the industry; gaining advocates among architects, builders, contractors, home-owners; obtaining the approval of the fire underwriters and fire department officials; until finally it becomes as a gigantic snowball growing larger at every turn, with the significance of it all being that Gypsum is still in its infancy, that it will continue to grow and that YOU, THE BUILDING SUPPLY DEALER may share in its growth.

and in

1923

Viewed from every standpoint there can be no possibility of doubt, that the year now closing has been the greatest in the history of Gypsum.

Cottage and mansion, office and factory, hospital and institution, have shared alike—for Gypsum's benefits are available to all. Is it Economy that is desired?—Gypsum is cheaper than any known construction of a permanent character. Is it Safety, Hygiene, Comfort, that is demanded?—Gypsum is testified to by Fire Chiefs, Underwriters, Architects and others while the practical proof is found in innumerable buildings all over America.

Great as 1923 has been, it is but a hint of what the dealer may expect of the future.

If you are a dealer and not yet handling Gypsum products, you must surely realize the desirable business you are sacrificing. If you are not yet thoroughly acquainted with our products and our plans for helping the dealer sell them, write us today. You will be placed under no obligation whatever.

THE ONTARIO GYPSUM CO., LIMITED

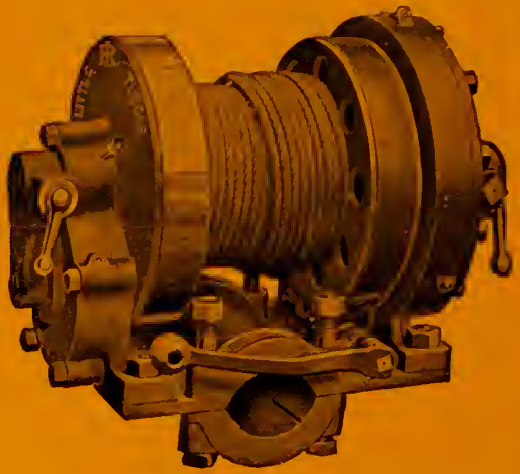
HEAD OFFICE: PARIS, ONTARIO

Toronto: 106 Don Esplanade; Montreal: 10 Cathcart St.; Windsor:
90 Labelle Bldg. Factories: Caledonia, Ont. and Lythmore, Ont.

Cleaning ship's hold

Hoisting a wheel-barrow load of bricks

Hauling logs in lumber camp



Spotting rock car in quarry

Spotting empty steel freight car

HERE are just a few of the many applications of the "Little Tugger" Hoist.

There is some place in every industry where "Little Tuggers" will save money.

"Little Tuggers" replace man-power and increase production.

Hauling mine car underground

Hoisting ashes aboard ship

Hoisting timber in shipyard

Made in Canada and shipped from stock.

Write for latest bulletins.

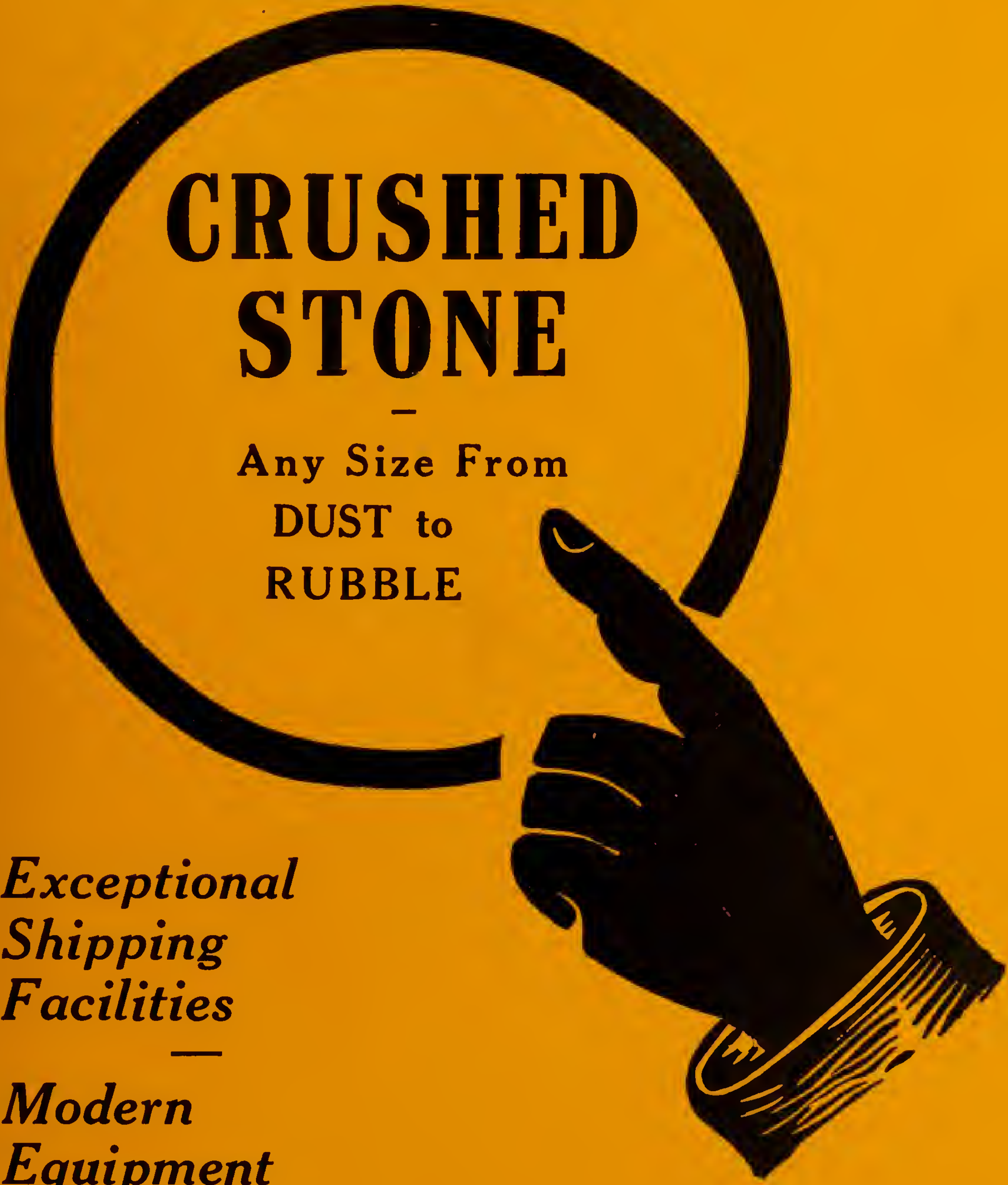
Hoisting steel angles in industrial plant

Canadian Ingersoll-Rand Company, Limited

Sydney Sherbrooke Montreal Toronto Cobalt
Timmins Winnipeg Nelson Vancouver

100-LH

Ingersoll-Rand



CRUSHED STONE

—

Any Size From
DUST to
RUBBLE

Exceptional Shipping Facilities

—

Modern Equipment

—

Prompt Service

Hagersville Quarries Ltd.

General Sales Agents:
Gordon & Armstrong
18 Toronto St., Toronto

Quarries: Hagersville, Ont.
Head Office: St. Thomas

CAST IRON PIPE

PONT-A-MOUSSON

"The Nearest Perfect Pipe"

16-in. Pont-a-Mousson Pipe installed at Verdun, P.Q.

Used from Coast to Coast—in nearly every Province in Canada.

AMONG the municipalities that have purchased Pont-a-Mousson pipe during the past year are:-

Nova Scotia—Canning, Kentville, Westville, Lunenburg.

New Brunswick—Bathurst, Edmundston.

Quebec—Bagotville, Iberville, Pointe Claire, Shawinigan Falls, Verdun.

Ontario—Renfrew, Iroquois Falls, Township of Ferris, Sturgeon Falls.

Manitoba—East Kildonan, St. Vital, West Kildonan, Winnipeg.

Alberta—Drumheller, Edmonton, Medicine Hat.

British Columbia — Kamloops, Prince Rupert, Penticton, Vernon, Point Grey, South Vancouver.

Repeat orders have been received from a number of these municipalities, including Bathurst, Point Claire, Medicine Hat, Prince Rupert and Edmonton.

The sizes supplied include 4-in., 6-in., 8-in., 10-in., 12-in., 14-in. and 16-in. pipe.

Pont-a-Mousson are prepared to ship pipe up to 24-in. out of stock, and up to 72-in. on order, with prompt delivery guaranteed.

Among recent large orders for Pont-a-Mousson pipe were 52,400 tons of 48-in. pipe for the city of Paris, and 28,000 tons of 48-in and smaller for Buenos Aires. Pont-a-Mousson is the largest pipe factory in Europe and can supply valves, hydrants, fittings and all cast-iron water works equipment.

We carry 4-in., 6-in., 8-in., 10-in. and 12-in. pipe and specials in stock at Montreal.

KENNEDY & COMPANY

285 Beaver Hall Hill, Montreal

Jas. Robertson Co. Ltd.,
ST. JOHN, N.B.

Empire W. W. Supply Co. Ltd.,
WINNIPEG

Gordon & Belyea Ltd.,
VANCOUVER

All Equipment for Sale or Rent
We Sell for Less

1—Travelling Derrick Beatty Hoist 3-drum, 7 x 12, with swinger and 1-yard Williams Bucket. Boom 60 feet long. Gauge 12′-6″.

1—Marion Model 21 on traction wheels, one year old. Condition like new. Equipped with Boom Hoist. ⅝-yard Bucket.

1—Type O Thew on traction wheels, ⅝-yard Bucket. Horizontal Crowd. Good condition. Very reasonably priced.

1—1-yard Williams Clam Shell Bucket. Heavy type.

1—6 x 12 Beatty, single drum Hoist, with Boiler, Drum 20″ x 22″.

1—6½ x 8 Double Drum reversible Marsh & Henthorne Hoist with Boiler.

T. J. McGovern
505 Lumsden Bldg., Toronto
Phone Main 2033

An Unbeatable Combination—the Fordson Tractor and the Wehr Grader

The illustration shows both in action—doing their work efficiently and at a minimum cost. The Fordson is a 10-20 H.P. Tractor at 1000 R.P.M. on kerosene which is ample for sub-grading, ditch-opening, edging, scarifying for road maintenance, etc. And the Fordson is not only powerful but it is thoroughly reliable and has proved itself to be exceptionally economical both as regards operating and maintenance costs. The Wehr One-man Power Grader is light but very strong and rigid. Note the 5 x 2 x ⅜″ Steel Channels are skillfully reinforced at the bridge with 2½ x 3½ angles, six feet long, thus making the frame stronger than a plain ten inch channel. Covers a wide field of usefulness, gives increased mileage at far less cost

We shall be glad to give you all the facts concerning this equipment. You'll certainly be interested. Write us today—NOW!

W. C. Warburton & Co., Ltd., 670 Bloor St. West, Toronto

DISHER STEEL CONSTRUCTION Co.

LIMITED

Offers an unexcelled Service in DESIGNING,
FABRICATING and ERECTING STEEL
- - STRUCTURES and BRIDGES. - -

Manufacturing Builders' Iron Works, etc.

Office and Works:

COMMISSIONER ST. (Foot Cherry St.) TORONTO, ONT.

"Crown" Metal Products Chosen Again

for more of Canada's Best Buildings

Recent jobs include—

Model School	St. Johns, Nfld.
The New Chateau Frontenac	Quebec, Que.
Blessed Sacrament Church	Quebec, Que.
Levis College	Levis, Que.
Medical Arts Building	Montreal, Que.
H. Morgan & Co's. New Store	Montreal, Que.
Dupuis Freres, Ltd.	Montreal, Que.
Grain Elevator "B"	Montreal, Que.
Civic Hospital	Ottawa, Ont.
Auditorium	Ottawa, Ont.
Albert College	Belleville, Ont.
Robt. Simpson Co., Ltd.	Toronto, Ont.
Gowan's Kent Building.	Toronto, Ont.
Queenston Power Station	Queenston, Ont.
Registry Office	London, Ont.
Grain Elevator	Tiffin, Ont.
Royal Jubilee Hospital	Vancouver, B.C.

We manufacture and contract for "Crown" Metal Products including, Shingles, Sidings, Ceilings, Corrugated Iron, Cornices, Skylights, Hollow Metal Doors and Interior Trim, Metal Covered Doors, Windows and Trim. Also any kind of roof—anywhere.

McFarlane-Douglas Co., Ltd.

250 Slater Street
OTTAWA, Ontario

INDUSTRIAL CRANES

DOOLITTLE RUSSELL CO. of Hamilton, Ontario, say this of their 15 ton **Industrial** locomotive crane, "We cannot speak too highly of the work we have accomplished with our **Industrial** crane. We have found it economical to operate and our costs are well within our estimate."

See article in "Contract Record" Dec. 19, '23 pages 1206-1211.

This crane has been working 12 to 14 hours a day since last April and has been idle only 6 hours for repairs. Among other things it has unloaded more than 2,000 cars of stone and sand.

There are 17 types of **Industrial** cranes from the baby 5-ton to the monster 200-ton, the largest in the world. They operate on rails, crawling tractor belts or traction wheels and their power is steam, electric or gasoline. Clamshell or dragline bucket, magnet, hook and block, dipper arm and pile driver work are accomplished at tremendous savings over other methods.

We shall be glad to forward promptly a copy of the Industrial Works 164 page Golden Aniversary catalog which fully describes and illustrates all types.

F. H. HOPKINS & CO. LTD.

MONTREAL **TORONTO**

ROSS-MEAGHER COMPANY

General Contractors and Engineers

Laurentian Building, Ottawa, Ont.

Telephone Queen 1747

A. C. ROSS, B. Sc. J. F. MEAGHER

GRANT BROTHERS CONSTRUCTION COMPANY Limited
OTTAWA - CANADA

Paving, Bridges, Culverts, Wharves, Dams
AND
General Highway and Railway Construction

36-37 LA BANQUE NATIONALE BUILDING TELEPHONE QUEEN 5928

Toronto Harbor Development, Roger Miller & Sons, Contractors

MARINE CONSTRUCTION

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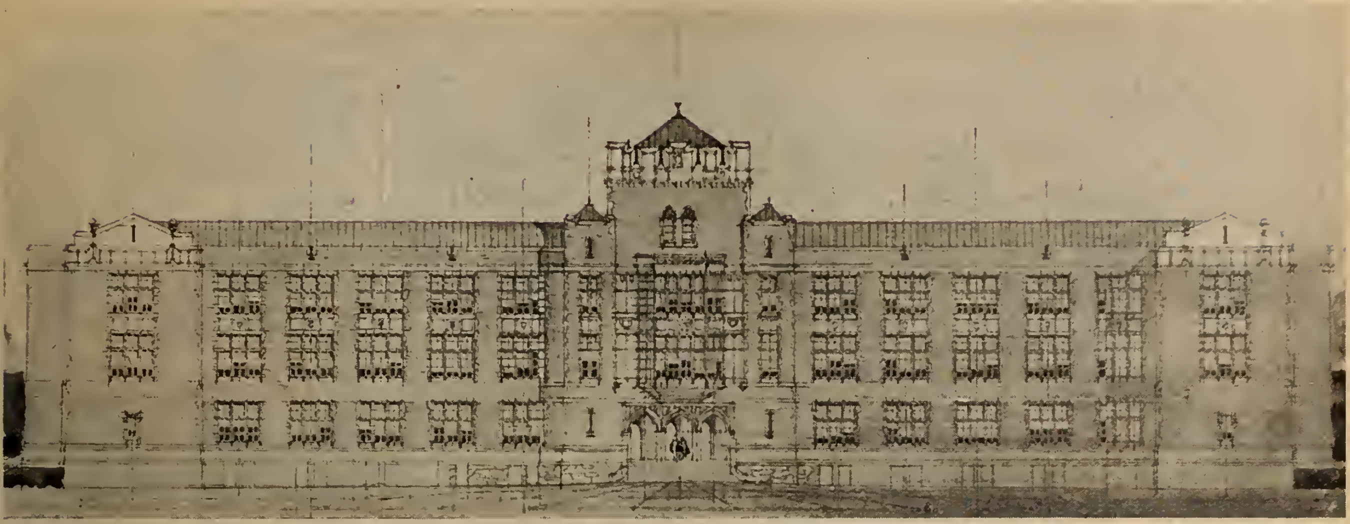

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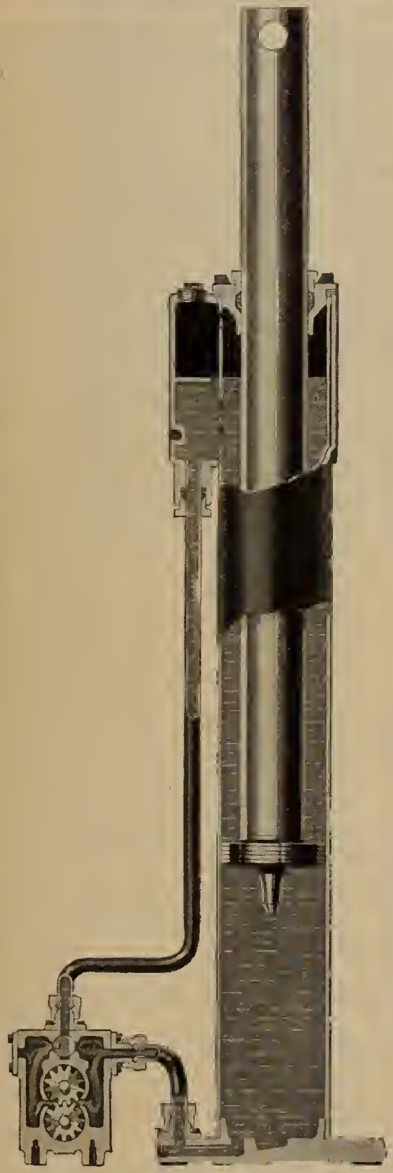

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Contract Record and Engineering Review

Devoted to Construction and Engineering

Vol. 37 Toronto, December 26, 1923 No. 52

Canada Has Had A Good Year—Next Year Will Be Still Better

ONCE again the Contract Record & Engineering Review presents for the benefit of its readers an "Annual Report" of the building and construction activities for the past year. In common with most financial reports being presented this year we feel that the story of the year's operations should give general satisfaction.

The big totals rolled up in this industry in 1922 have been exceeded by a nice margin. Last year's total was three hundred and fifteen millions of dollars. This year it is three hundred and forty-five millions, an advance of about ten per cent.

There is no indication that this rate of increase is not likely to be maintained. We are still under supplied with homes, except in very special localities. The gradual expansion in business at least ensures the normal demand for more of the larger type of buildings. Industries are almost without exception issuing much improved annual reports and expressing optimism for next year. Some of the largest engineering undertakings in the world are under way and under immediate consideration at different Canadian points.

The past year has, possibly, been the least eventful in Canada's history and she has taken advantage of it to recuperate. As a nation we are wealthier, healthier, more optimistic, more firmly convinced of our own destiny than ever before. The little clouds on the horizon are nothing more than can be dispelled by the Morning Sun of Confidence—and Work. Canada is in fact learning that she is a nation. All evidence points to 1924 being another big stride toward that goal.

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Canada's Prospects for Nineteen Twenty-Four

What Business and Banking Authorities See Ahead of Us During the Next Year—No Place for Pessimism as to What the Future Holds Out for the Dominion

Looking backward to Christmas week a year ago one readily recalls that there was more than usual pessimism, not only in the building and construction field but in almost every line of Canadian commercial endeavor. A few hoped for the best but the majority were dreading the worst.

Today, generally speaking, we can laugh at our fears. The worst did not happen. It perhaps is truth to say that the excessive optimism of the few did not happen either. There have been no convulsions in business. Perhaps, indeed, there has never been a less eventful year in Canadian history. However, there can be only one conclusion as to where we stand today. We're at a higher level. There are more people dispensing cheer, fewer long faces. Canadians in the main are confident, satisfied that we stand on a firm foundation, and that we are building upward surely, if slowly.

It has been said so often, without contradiction, that local conditions depend on European settlements that we now accept this theory as a fact. It is not easy to explain just how far, or in what way, continental conditions have improved and yet looking back a year we must all feel that things are working themselves out. The problems of those war-ridden countries are not such as can be solved over night, by a group of politicians. Time in this case is the best healer, and there can be no doubt that the past year brings within measurable distance the answer to problems that, earlier, seemed quite unsolvable. To that extent at least Canada profits.

Less Extravagance is Needed

Locally, the need of the hour is a return, in considerable measure, to a desire for simpler and less extravagant living. The average Canadian has had quite as much money to spend during 1923 as in an average year. In spite of this nearly every old established line of retail trade reports business as being slow. The answer must be that our people are spending on non-essentials. Undoubtedly the motor car comes first in this category. It is a common sight today to see from four to six mechanics' motor cars lined up in front of any house under construction—luxuries the house owner himself, and frequently also the contractor, cannot afford.

As long as this desire to own a motor car was confined to a class of citizen who could buy and maintain it out of surplus funds the effect on the general retail business was not keenly felt. Now, however, it would seem that the craze has taken hold of the man—apparently representing a large class—who was never at any time able to build up a reserve, was merely making both ends meet; in consequence, whatever he spends on his car he skimps from his family's living expenses—groceries, clothing, furnishings, shoes, etc.

What does 1924 promise?

The effect of the biggest crop in our history has not yet been felt to any extent. As the money for this record crop gets into circulation it will mean business improvement all along the line from the retailer to manufacturer. The same applies, in considerable measure, to our mineral output.

Our government promises us increased population. This will directly affect us in many ways. It will mean increased production for export, increased local demand for home consumption, increased demand for housing and working accommodation, perhaps to some extent reduced cost of manufacture and construction. It will mean the utilization of big natural resources that are useless as long as they lie dormant. It will also presumably introduce into our country a much needed leaven of old fashioned ideals of the relationship of the workman to his work. Immigration, properly controlled, holds out big promise for future years.

What the Statisticians Say

Finally, there are the theories of the statisticians. The value of the study of experience of the past, on a systematic basis, is gaining recognition. The recurrence of cycles in business conditions seems to have been established with sufficient certainty that useful forecasts of the future can at least be suggested. Babson and Persons in the United States, and Michell in Canada, are well known names in this connection and it is interesting to note that these are all in fair agreement regarding the immediate future. According to their forecasts the condition of "marking time" which now obtains, may continue next year. They definitely express the opinion that there is no marked depression ahead of us; they are hopeful, and indeed confident, that the steady improvement of 1923 will continue and gain force as the year advances.

In this connection the views of some of our best known industrialists and bankers are of supreme interest at this time. One of the biggest industries is the electrical industry. It is growing by leaps and bounds and consequently is becoming a fair barometer of general conditions. The following interesting comments by the president of the Canadian General Electric Company, Mr. A. T. Dyment, speak of "continued growth." Sir Frederick Williams-Taylor, general manager, Bank of Montreal, makes some pertinent suggestions on our financial situation. Mr. C. Howard Smith, speaking for the great Canadian paper industry says we are "on the steady up-hill climb." Brief summaries of the situation as seen from four different angles by these authorities are printed below:

"A Better Year in 1924 than We Had in 1923

By C. Howard Smith*

I look for a better year in 1924 than we have had in 1923. The changes made in the sales tax have been a very serious detriment to business. There has been a great deal of uncertainty as to the way this tax would be applied, and as to how it would affect different things, and I am of the opinion, if this tax had been left in the former shape, that business conditions in the last half of 1923 would have shown up better than they do. The worst thing for business of any kind is uncertainty, and want of confidence, and for the last six months there has been very great uncertainty, which breeds this want of confidence.

The paper industry has expanded in 1923 to a remarkable extent and I look for further expansion in 1924, although we are getting to a point (if we have not already reached it) where our resources in the way of timber are being cut to a dangerous extent, and it may be that this development, which has meant so much to Canada in the last few years, cannot increase much further.

The continued reductions in the tariff since the war have arrested productive business to a very marked extent, but on the other hand, there is a feeling now that the worst has happened and that we are practically on a revenue tariff basis that will go no lower.

There is still the marked tendency of the people to congregate in the cities and leave the farms, and this always means a certain amount of extra construction in the cities. We are still short of housing capacity for the population.

A number of industries have signified their intention of starting in this country, and no doubt construction work will be started next year. I particularly refer to Courtald's, manufacturers of artificial silk, who have decided to locate their plant in Cornwall, Ontario.

The financial situation has, apparently, cleared, and I believe that we are on a safe and sane basis at the present time, and this quiet confidence in our financial stability will, undoubtedly, lead to further developments.

On the whole, I think we can look forward to 1924 with considerable confidence. We have certainly passed over the peak of the depression, and are on the steady up-hill climb, which, I believe, will continue unless something unforeseen happens.

---

*President, Howard Smith Paper Mills, Ltd., Montreal, and president, Canadian Manufacturers' Association.

"An Improvement is Bound to Ensue"

By Sir Frederick Williams-Taylor*

It has been a trying year for Canadian bankers, probably as trying as any year since confederation in 1867. In Canada, as elsewhere, as a consequence of the loss and distress resulting from the disorganization of business and industry a spirit of unrest has developed among groups of individuals, inclining them to listen to the vain pretensions of agitators promising quick relief from ills which only time and adherence to sound business principles can cure. Nevertheless, we are better off in this respect than is the case with others in many countries; it is a passing phase, nothing more.

Also, at this particular juncture economic and political confusion abroad necessarily reacts upon this country to an important extent, while it seems more than ever apparent that for all time our economic welfare must be under the special influence of conditions in the United States of America. It is so important to bear this in mind that I may be excused if I repeat the remark contained in my address to you a year ago:—Canada cannot progress as she should until our cost of living and our taxation are less than across the line.

Canada's economic position will not be satisfactory until we succeed in balancing our public revenue and expenditure, including railways.

I venture to suggest to the government that a healthy and more widespread interest in the finances of our Dominion would be stimulated by the publication regularly in the press of simple standardized figures giving the essence of the whole position, including the result of our National Railway operations.

For the time being we are handicapped in three distinct respects, two of which are common to all counties engaged in the war from the beginning and at present endeavoring to balance their budgets, viz., high cost of living and high taxation. Further, Canada is suffering from lack of adequate population:

As the first two handicaps diminish we shall doubtless attract a greater volume of immigration, and, what is still more important, we shall retain the people who come, as well as our natural increase. Therein lies economic salvation for the Dominion. The remedy is in our own hands and is practicable. We have only to conduct our personal and public affairs more economically than do our neighbours in that most wealthy and free-spending of all countries, the United States.

---

*General manager, Bank of Montreal.

Adversity is a severe teacher, but out of our trials of the last two years surely good will come.

Meanwhile we must not lower our flag, nor is there any occasion for doing so. Canada has priceless advantages as a place to live in, to work in and to play in. These should be obvious to all—as indeed they are to our friends in the United States, who now have $850,000,000 or more commercially invested in Canada—and they will without question attract to us in the fulness of time the people we need.

Prosperity in full measure cannot, however, return to this country until agriculture, our chief industry, becomes again more profitable. The lot of the farmer in the last few years has been hard, owing to low prices for products and high cost of requirements. This unfortunate state of affairs still persists. It is the result of worldwide, not local, conditions, and is by no means confined to Canada. Agriculture, however, cannot be permanently depressed. In the nature of things an improvement is bound to ensue, but the burden in the meantime bears heavily upon this vital industry.

"We Should Expect to See a Continued Growth in Industry

By A. E. Dyment*

Conditions in the electrical equipment industry in Canada have shown a very marked improvement during 1923, as compared with the preceding year. Business conditions generally were somewhat depressed during the first nine months of 1922, but during the last quarter of that year a fairly satisfactory improvement was experienced. This improvement was indicated by a considerable increase in inquiries received, but was too late in materializing to have had much effect upon the total production for the year 1922. The year 1923 began and has continued fairly satisfactorily, and the closing months of the year are showing still further improvement. While this is encouraging, and we are reasonably satisfied with the steady progress made during the year, business is still somewhat below normal.

Labor conditions have remained satisfactory from a manufacturing point of view, though at the present time there is no slack labor, and if conditions continue to improve as they have for the past three or four months, we anticipate a possible shortage of labor in 1924 unless active steps are taken by our governments toward immigration of both skilled and unskilled labor.

There has been a free movement of raw materials this year, and deliveries have been fairly prompt. The prices of such basic raw materials as we are chiefly interested in, such as iron, steel, copper and brass, have on the average shown a slight decline. We feel the present level of values will be pretty generally maintained for the first quarter of 1924, with indications of increasing demand and possibly a stiffening in prices after that period.

In the electrical industry, owing to the length of time required to fabricate the heavy machinery and equipment for the large power develments, changes in general business conditions are not reflected as quickly as in other lines of manufacture where the span between the date of the order and the date of shipment is much less. For this reason the electrical industry is slower in feeling the effects of a trade depression. Similarly, when business revives, even though the volume of orders placed may be very satisfactory, it is some months before the improvement is manifest in the profit and loss account.

There is one cloud, however, which is materially lessening the sunshine of prosperity, and that is the high rates of domestic taxation coupled with the continued downward trend of the tariff,. The enormously depreciated currencies of the highly productive countries of Europe are having the effect of causing the importation of many articles into Canada at abnormally low prices, with which it is absolutely impossible for Canadian industries to compete, and something should be done to protect them against such an abnormal situation.

In conclusion I believe that given reasonable assurance of stabilized conditions we should expect to see a continued growth in industry which is so necessary to the welfare and prosperity of our Canadian people.

"We Have Seen the Worst"

By C. O. Stillman*

Our own construction program during the past year included the completion of a new refinery at Calgary, and this is a plant of a capacity of 6,000 barrels of crude oil per day and cost several million dollars. It is, I think, the equal in modern design and equipment of any refinery in America and I believe that in the coming year it will be the object of many a pilgrimage of refinery engineers. With its completion we have rounded out our chain of refineries, which now number six and extend from the Atlantic to the Pacific. Our own construction program for the year 1924 will be largely confined to the extension of our marketing plant and to the extension and alterations of our refineries which alterations, owing to the nature of the business, are always in a greater or less degree under way.

As to the general situation, much will depend upon the improvement of the purchasing power of the farmer. While our crops have been good, the net return to the agricultural industry has not been as large as we all would have liked to have seen it, and this condition may continue while domestic consumers of farm products in this country are numerically not much more than equal to the producers. In my opinion, our national policy should be to encourage the immigration of artisans, as well as agriculturists,—in fact in even greater numbers. We need more people on the land in this country, but we also need more industrial operations, and while there may be some unemployment in the cities now a larger population would tend, in time, to correct rather than aggravate this situation. If our mining industry develops, as those identified with it in a large way expect it will, we could absorb a very considerable number of people in Northern Ontario, who would create a new market for our manufacturers as well as our farmers. The building boom in the United States this year proved a serious drain upon us in that it drew heavily upon our industrial workers. Undoubtedly a great many of these people will return when they realize that the lure of higher wages has failed to bring them any increase in permanent wealth, but there must be some measures taken to stem the tide of this emigration which invariably accompanies a period of construction activity in the United States.

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*President, Canadian General Electric Co. Ltd., Toronto.

*President, Imperial Oil Ltd., Toronto.

We have been through an exceedingly difficult and trying period, but in my opinion we have seen the worst. There are at last signs of progress in the rehabilitation of Europe and with the gradual merging of all the powers in a concerted policy, we may expect a general rebuilding of the foreign markets upon which must depend our prosperity.

How Will Building Costs Tend to Go During 1924?

Three Prominent Contractors State Their Opinions Regarding the Prospective Trend in Construction Costs Based on Their Experience During the Past Year and Their Knowledge of Conditions

The inside history of construction during 1923 is informally outlined in letters we print from three contractors who are representative of the best work being done in Canada today. They differ in detail, perhaps, but they all agree on general principles. It has been a strenuous year; labor efficiency is only "fairly good"; material prices have not justified reduction in building costs. The prospects for 1924 are for a continuation with narrow fluctuations. As regards future costs, no doubt Mr. Carswell is sincere in his advice to those who contemplate building to do their "Christmas Shopping Early." This may not mean that prices will certainly increase, but rather we believe it is the expression of a conviction that prices will not decline, while delay naturally tends to add to the cost of the work:

Advisable to Build Early

By J. B. Carswell*

The year 1923 has been, perhaps, the most stable year we have had since before the War. As you will recall, our Index Figure in Canada, based on 100 in the year 1914, rose after the Armistice to around 200 in the Fall of 1920. 1921 saw a very rapid decline, which decline stopped up quite sharply at the beginning of 1922.

Since the beginning of 1922, we have been experiencing those seasonal waves of variation which go hand in hand with normal business. In other words, prices began to stiffen in the summer of 1922 to fall again during the winter of 1922-23. During the past year, building costs in the early spring were lower than they are today by a few points, and a gradual rise was experienced as the summer work increased in volume. Now that the rush is over, the market appears to be declning again, although the decline is not as early nor as marked as it was a year ago just now.

We made a comparison in our office just the other day on a large commercial structure figured in November, 1922, and again re-figured at the end of November, 1923. and we came to the conclusion that the price today would be a little higher, but that if we waited a month or two until the seasonal decline came into effect, the price would practically be the same as in November of last year.

All of this would seem to indicate that these seasonal waves, or ripples, are, if anything, bringing the index figure a little higher instead of a little lower, as might be anticipated. In other words, the tide appears to be coming in, although it is moving very slowly.

The index figure in March 1922 was around 160, and today the same figure prevails as an average on all classes of building construction.

The labor efficiency, we are glad to note, is still fairly good, although not quite as good as obtained in the spring and fall of last year; but nevertheless, it is a great improvement on the efficiency obtained during the war period.

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*President, Carswell Construction Co. Ltd., Toronto.

There is every indication that this coming winter and the early spring will be the cheapest periods in which to place building contracts. After the early spring we may expect once more the seasonal advance in costs, but whether the tide will be going out next winter or still be coming in is very difficult to say. Anyone who is in want of a building should consider these features carefully, and if they will take our advice, they will do their "Christmas Shopping" early.

Materials Will Determine Costs

By John V. Gray*

In general our records show that at the beginning of this year costs and production were about normal. During the summer and up to the present time the tendency of common labor and rough finished carpentry has been toward increased production and gradually decreasing costs in most operations. In brick work and masonry our production curves are falling and show not the slightest tendency of a reaction to normal output. In fact on one of our contracts brickwork in November showed a decrease ot nearly 40% output per bricklayer per day on the same type of work done in April and May.

As for 1923 we believe that carpenter labor and common labor costs will be slightly lower than in 1923. Carpenters were raised during this year and on all our projects their output warranted the raise. Bricklayers, it is said, will receive an increase after May 1, 1924, and we sincerely hope that their increased production will more than overshadow their increased rate. Labor should be more plentiful and of the good standard for this year.

We cannot foresee any marked decline in construction costs during the coming year unless it comes in building materials.

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*President, John V. Gray Construction Co. Ltd., Toronto.

Costs Within Reasonable Control

By A. R. Holmes*

With reference to construction costs, we have found, throughout the year 1923, that our costs have been somewhat easier than during 1922. The reduction has been brought about partly by slightly lower cost of materials and through better co-operation of our employees.

We have found less unrest among all the trades combined with a greater willingness to produce work more efficiently.

As to a forecast for costs during the year 1924, we are of the opinion that, as there are so many unknown quantities to be considered, a forecast becomes purely a useless guess.

We find competition in all lines very keen and believe that these conditions will extend well into the coming year in which case we look for prices and costs in general to be well within reasonable control and should have a favorable effect upon the volume of work which will be brought out.

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*President, Archibald & Holmes Ltd., Toronto.

Building Permits Reports for November 1923

According to reports tabulated by the Dominion Bureau of Statistics, there was a decline in the value of the building permits issued during November as compared with October. The permits issued during the month under review also had a lower valuation than those issued in November, 1922. Statements were furnished by 56 cities, showing that they authorized building to the value of $8,003,601 as compared with $9,701,080 in October, 1923, and $10,085,415 in November of last year. There was, therefore, a decrease of $1,694,479 or 17.5 per cent. in the first and of $2,078,814 or 20.6 per cent. in the second comparison.

Detailed statements were furnished by 45 cities, which issued approximately 1,100 permits for dwellings at an estimated cost of more than $4,800,000 and for 2,100 other buildings valued at slightly over $3,100,000. During October detailed reports were tabulated from 47 cities, which issued approximately 1,400 permits for dwellings estimated to cost nearly $6,200,000 and for over 3,000 other buildings at a proposed cost of approximately $3,400,000.

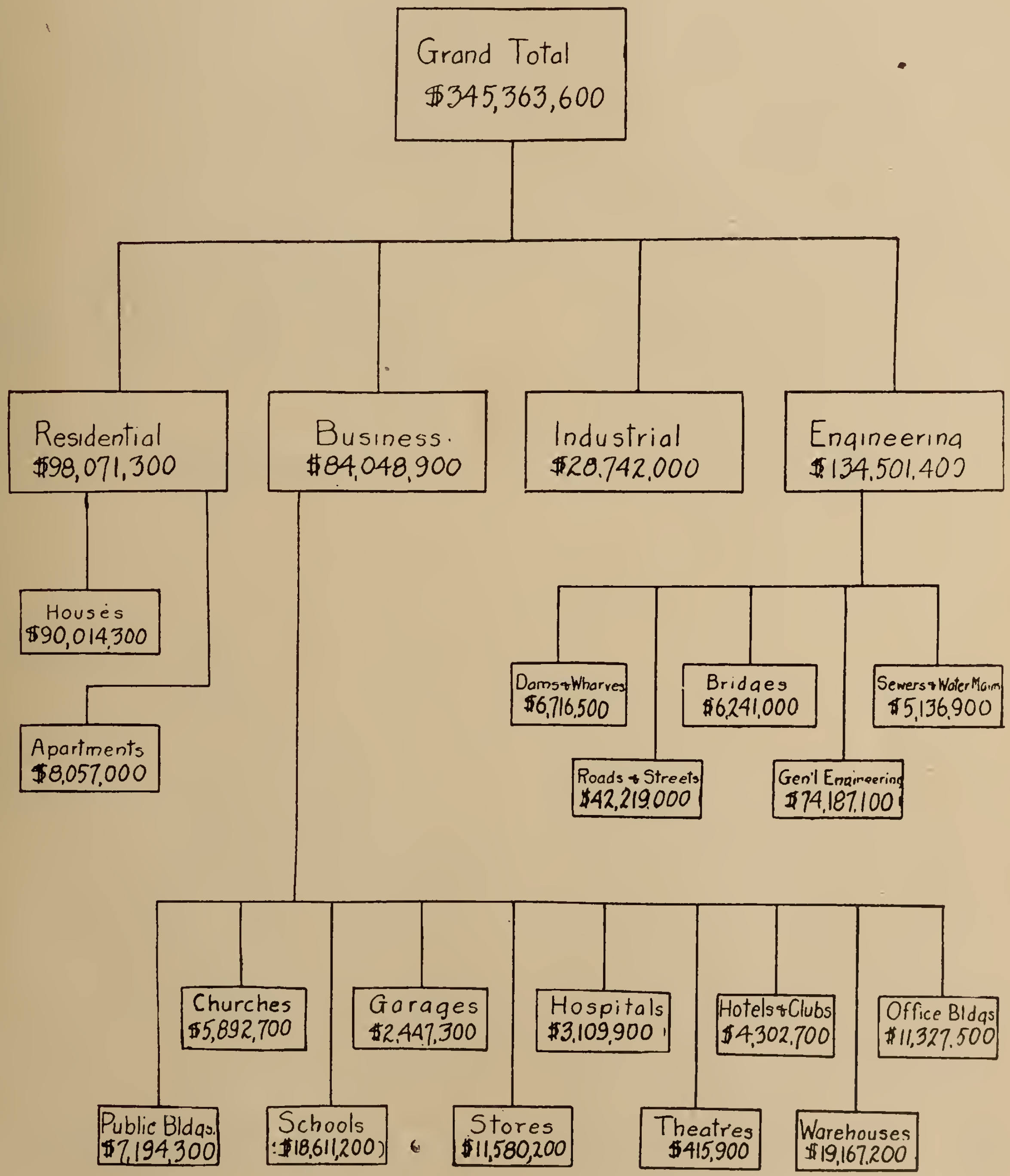
Manitoba and Prince Edward Island reported increases in the value of the permits issued as compared with October; in the former province there was a gain of 9.4 per cent. The largest actual decrease in the remaining provinces occurred in Ontario, where the value of projected building declined by $962,685 or 19.1 per cent. The most pronounced percentage decrease, however, was that of 79.8 per cent. in New Brunswick.

As compared with November, 1922, Quebec, Manitoba and British Columbia reported increases in the estimated value of buildings. Quebec showed the largest actual increase, of $431,499 or 20.3 per cent., while Manitoba registered the greatest proportional increase, of $228,363 or 99.9 per cent. Ontario, with a decline of $2,620,924 or 39.1 per cent., recorded the most pronounced actual loss, but the largest proportional reduction occurred in Alberta, when the value of building permits showed a falling off of $326,849 or 81.4 per cent.

Next Issue Also a Review Number

Owing to lack of space in this issue several articles of a review nature will appear in the first issue of the new year—that of January 2. These will cover all phases of construction work.

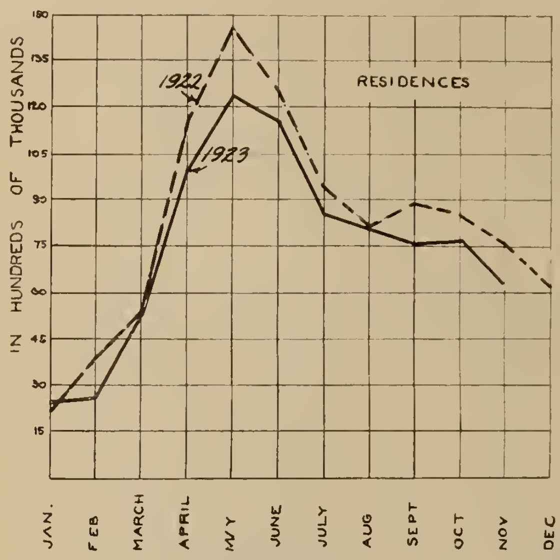
Canada's Building and Construction During Nineteen Twenty-Three



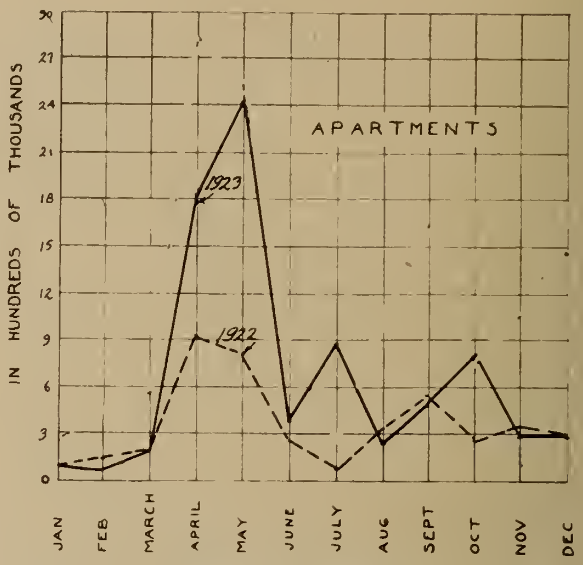
The distribution of the $345,363,600 spent on construction this year

Construction During Nineteen Twenty-Three

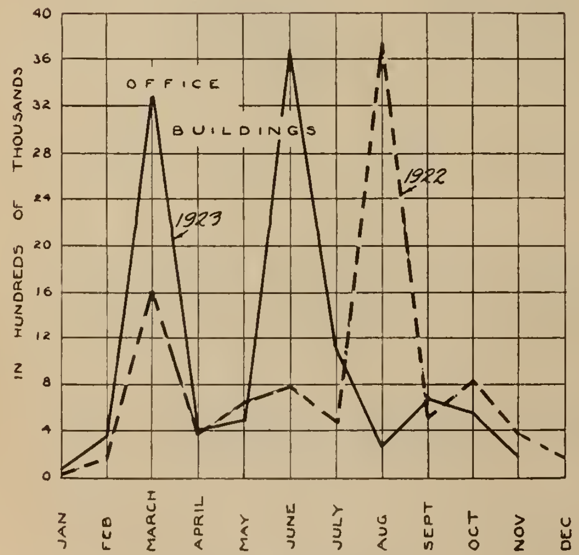
Work Undertaken Month by Month



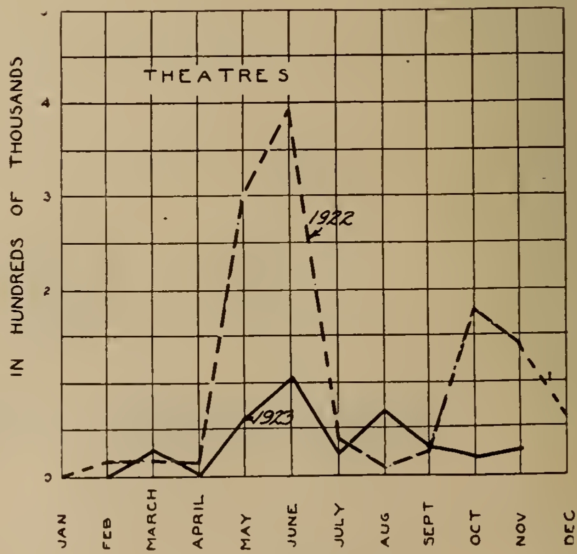
Residences



Apartments



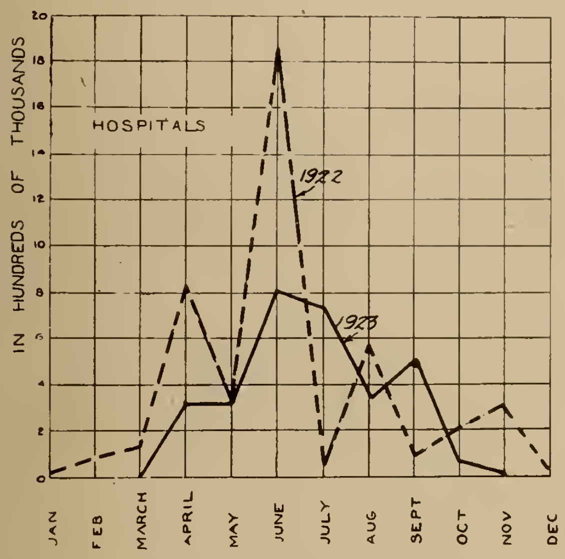
Office Buildings



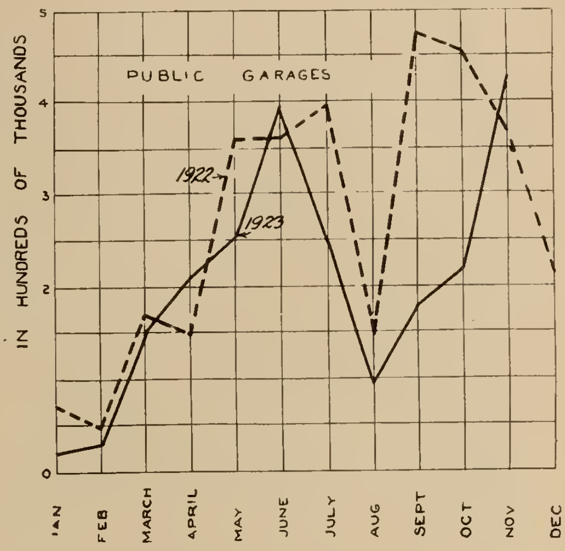
Theatres

Construction During Nineteen Twenty-Three

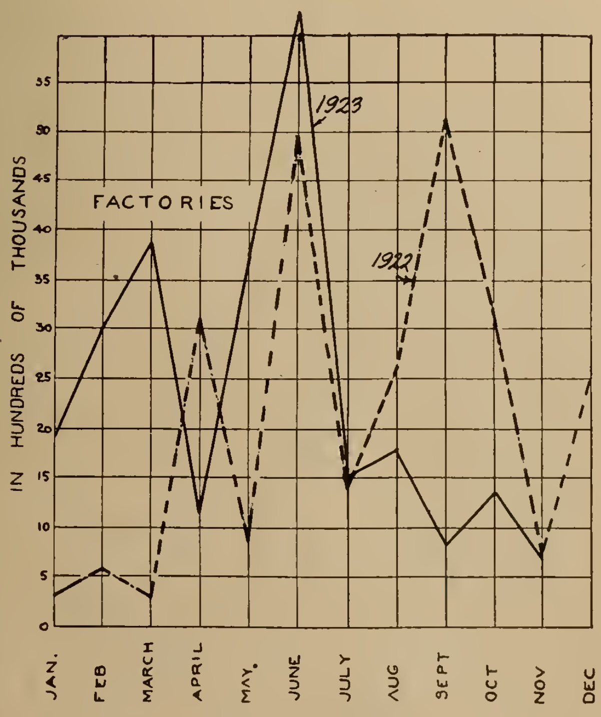
Work Undertaken Month by Month



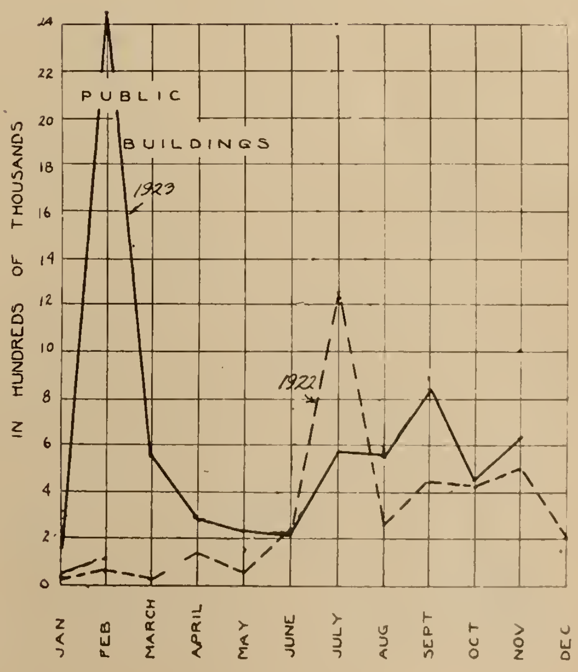
Hospitals



Public Garages



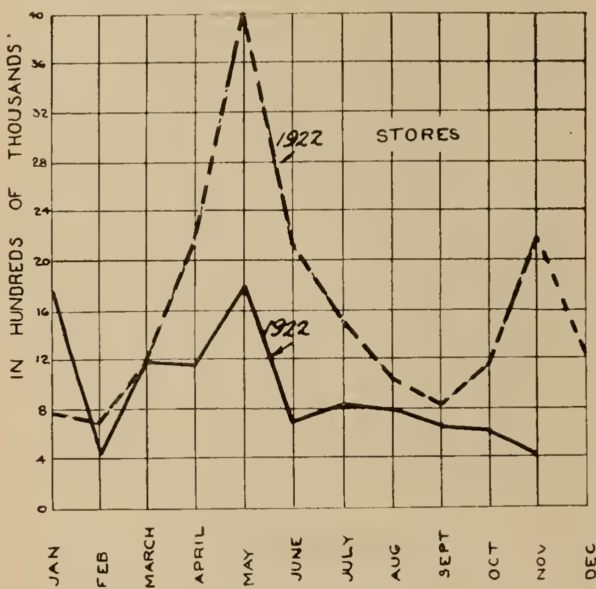
Factories



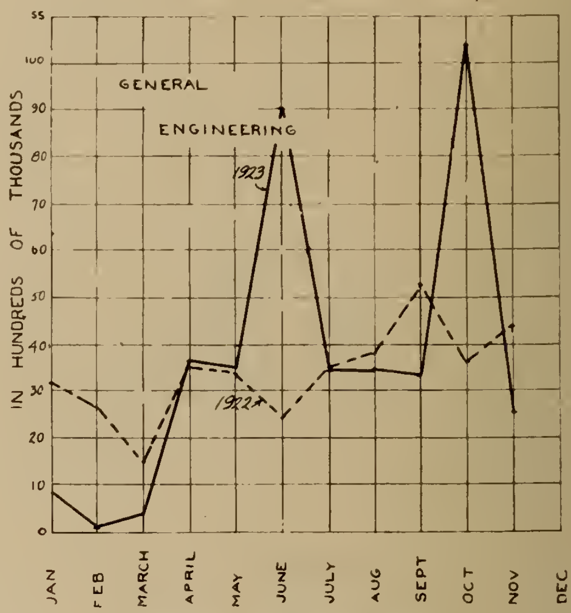
Public Buildings

Construction During Nineteen Twenty-Three

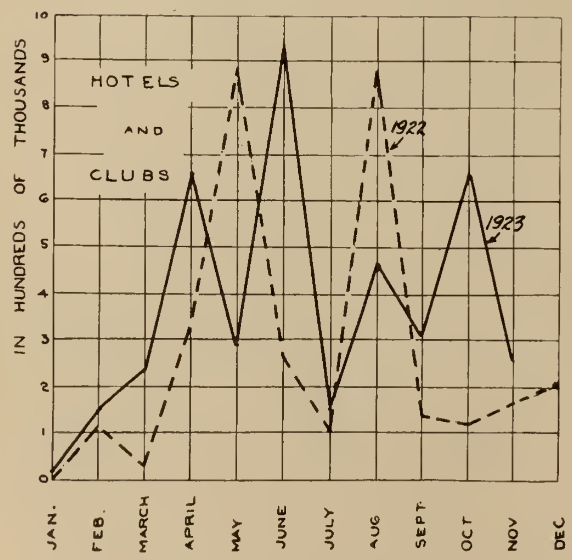
Work Undertaken Month by Month



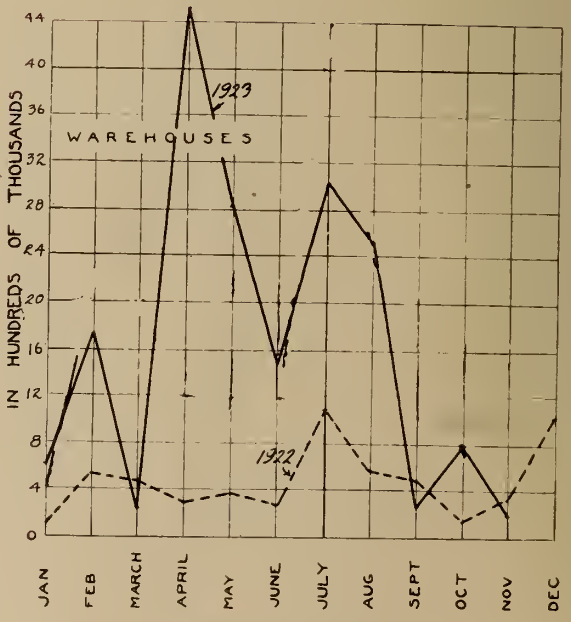
Stores



General Engineering



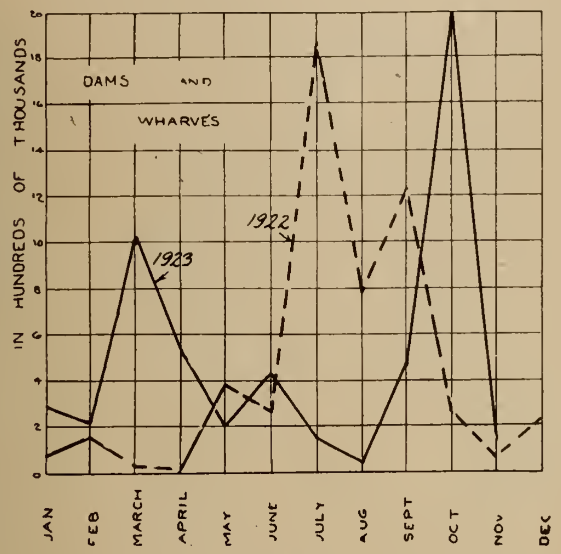
Hotels and Clubs

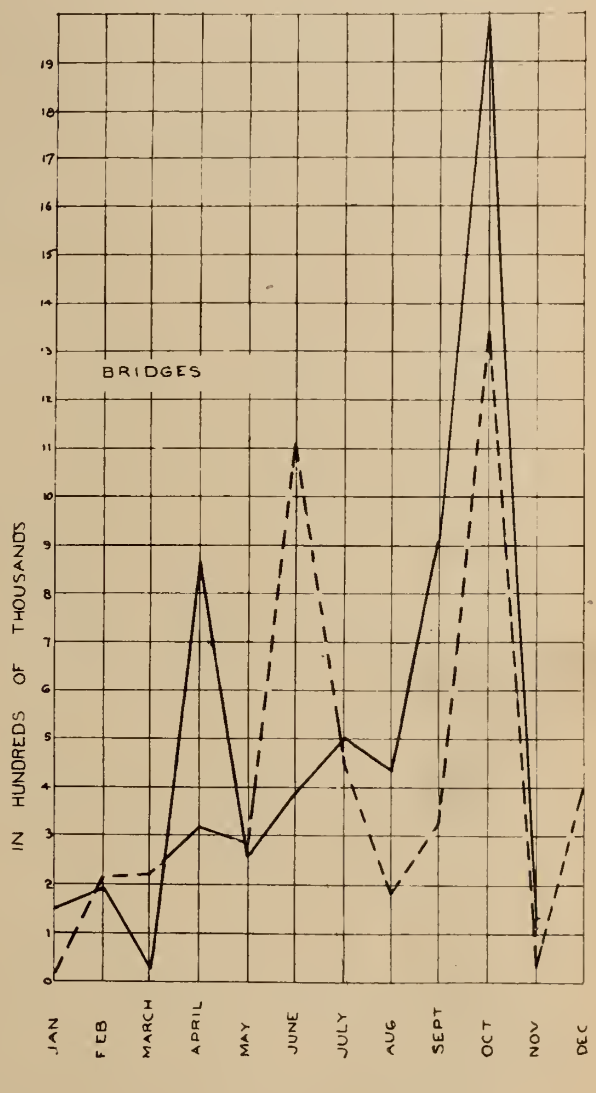


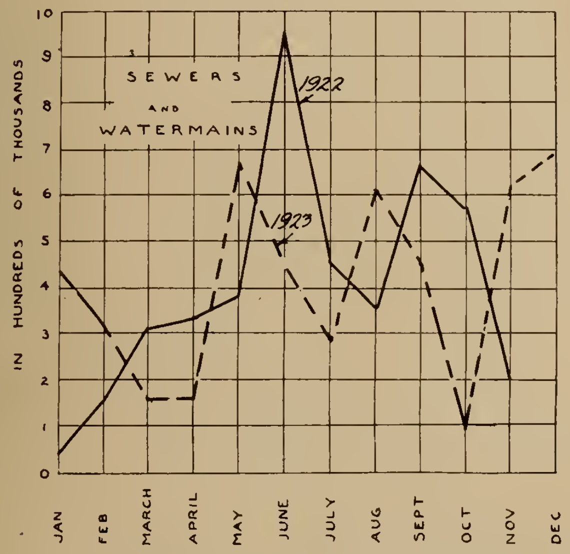
Warehouses

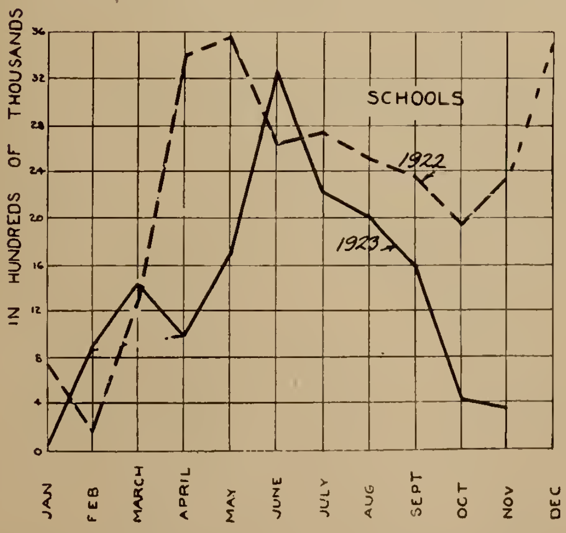
Construction During Nineteen Twenty-Three

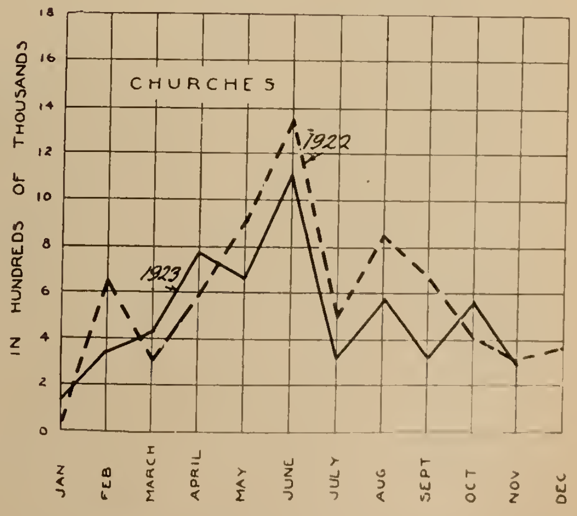
Work Undertaken Month by Month





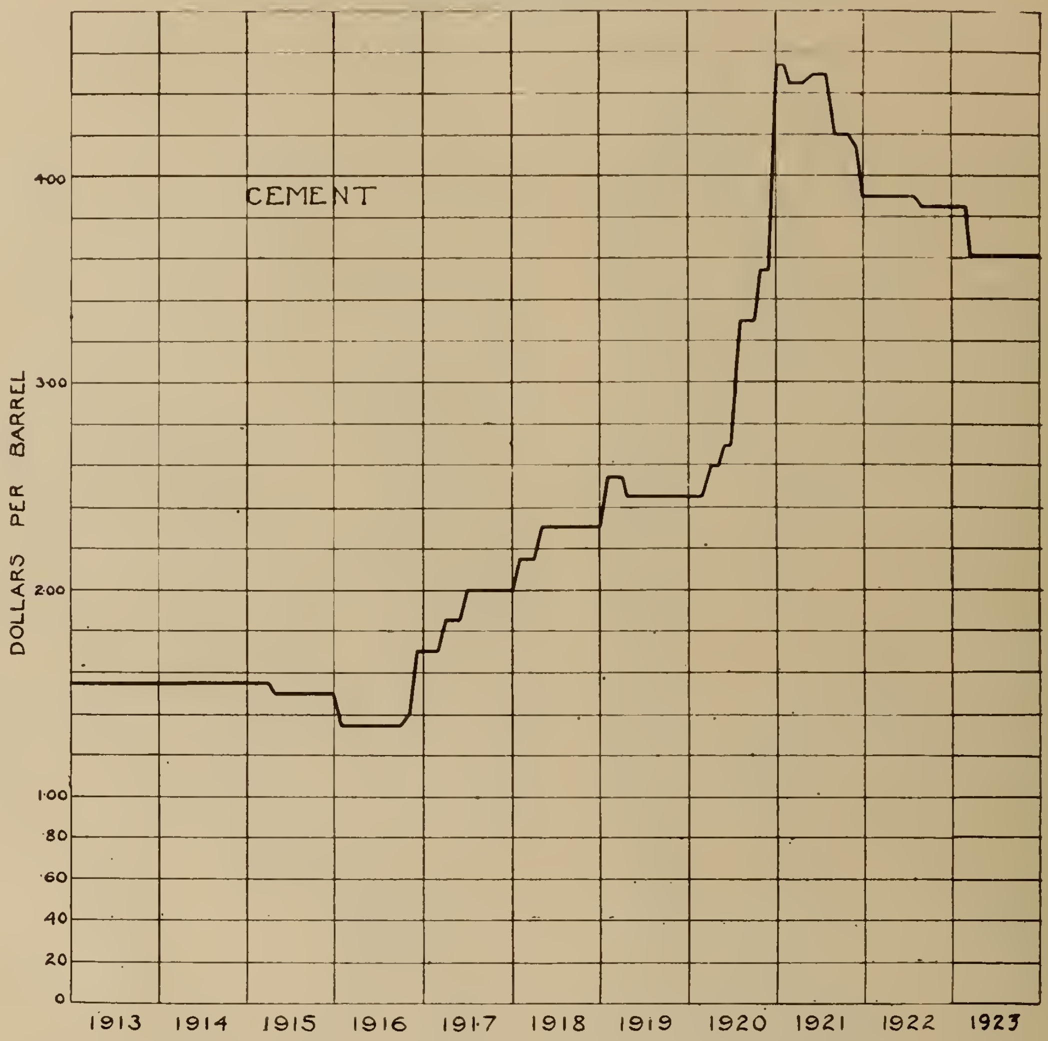


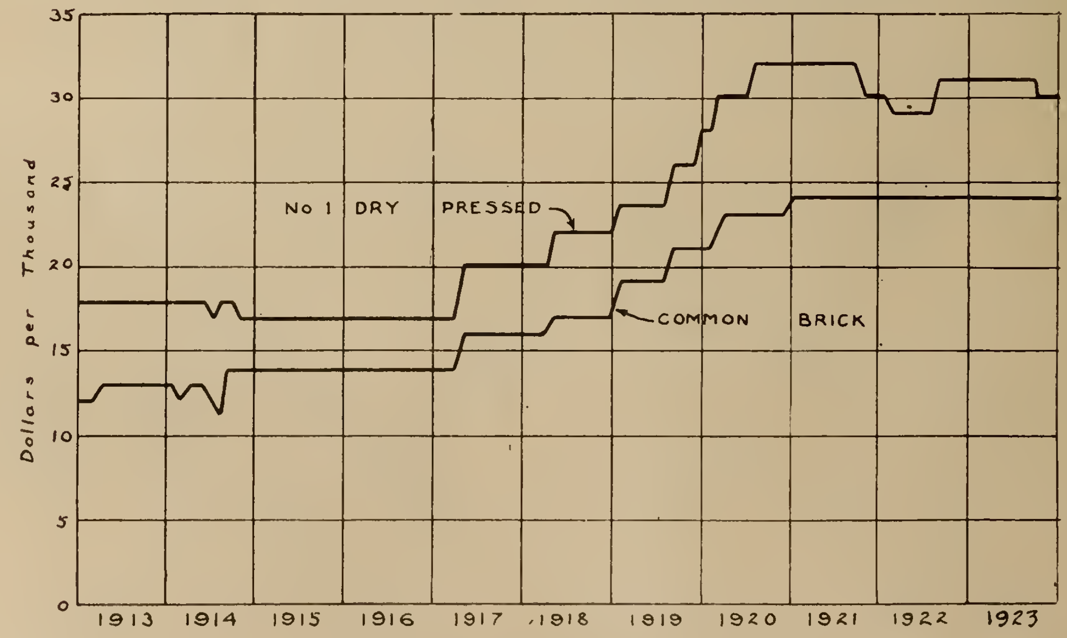




The Trend in Building Material Prices

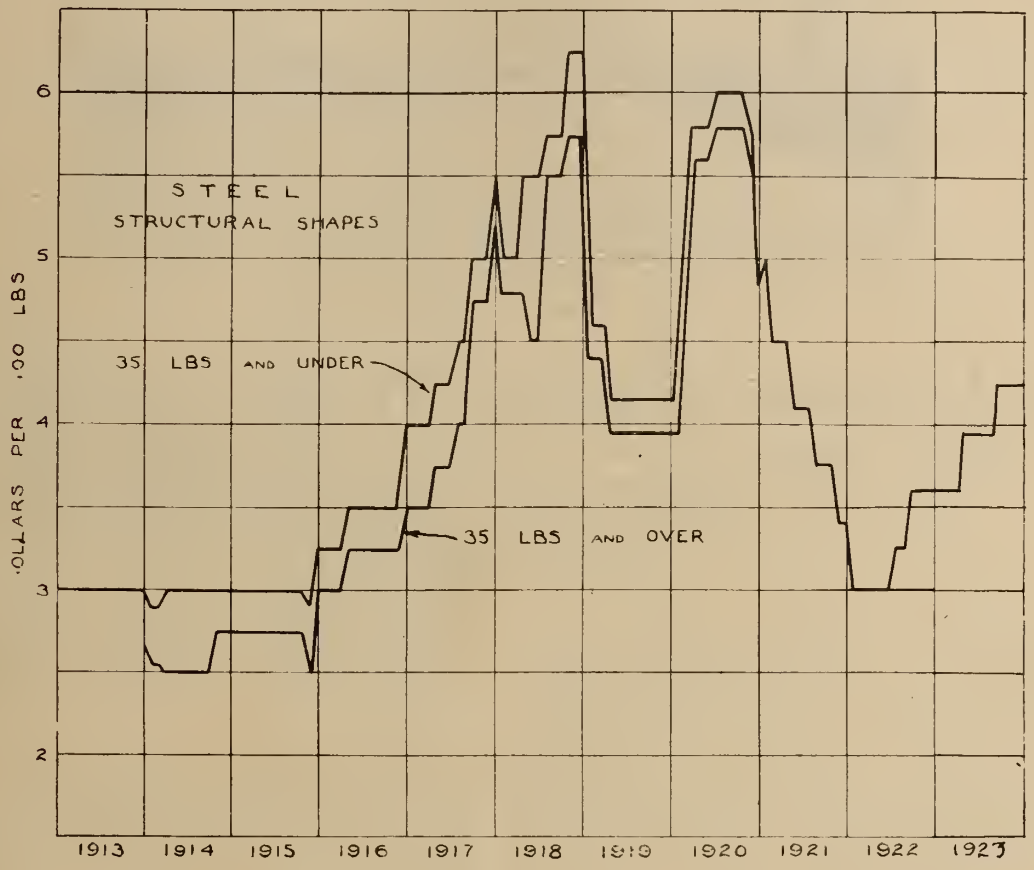
1913—1923

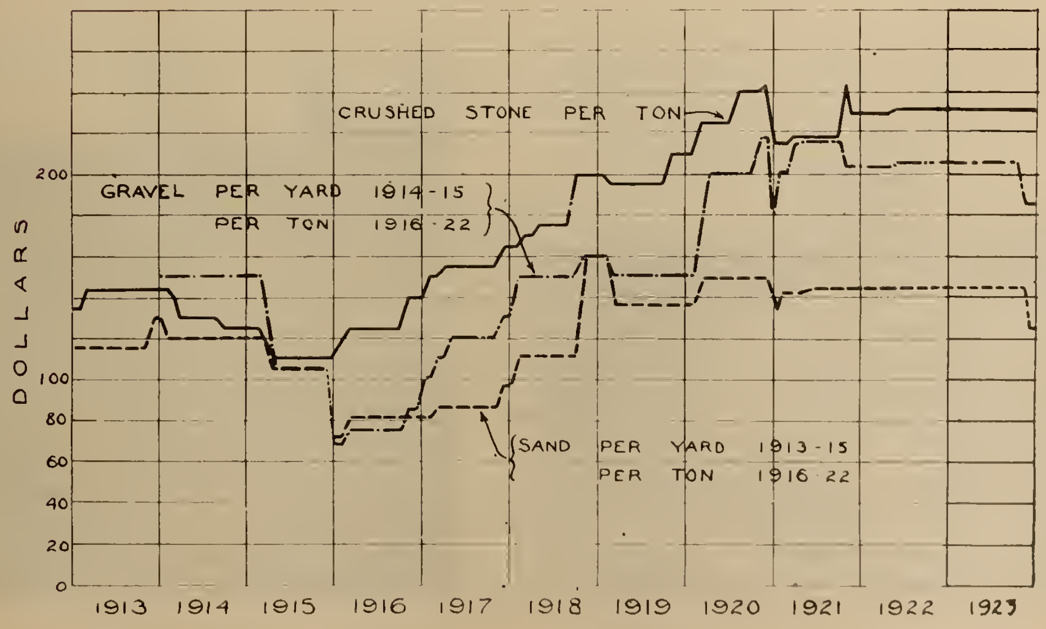




The Trend in Building Material Prices

1913—1923





A section of the Ottawa-Kingston provincial highway

The Ottawa-Kingston Provincial Highway

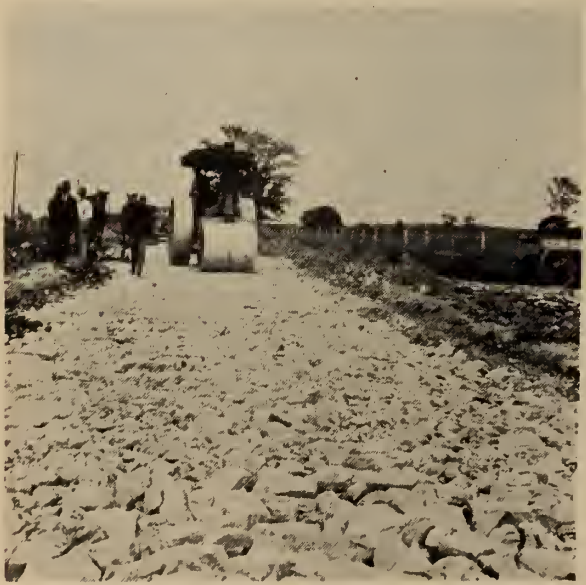
Recently Completed Section Consists of a 4 in. Macadam Base on a 7 in. Macadam Sub-base, with a 3 in. Top of Asphaltic Concrete—Methods of Construction Outlined

By L. M. J. HOWARD
Grant Bros. Construction Co. Ltd., Ottawa, Ont.

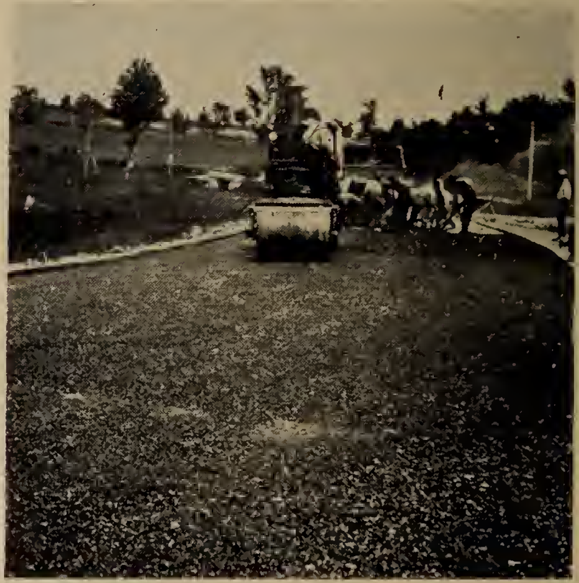
During 1923, Grant Brothers Construction Company Limited, Ottawa, Ont., were awarded several contracts by the Department of Public Highways of Ontario and the Ottawa Suburban Road Commission, which they have satisfactorily completed. In this article one of their most important contracts will be described with regard to the methods they employed, the equipment used and the means by which they speeded up work. The job referred to is that portion of the Ottawa-Kingston highway constructed by them for a distance of seven and four-tenths miles.

Tenders called for a base of four inch waterbound macadam, twenty-one feet wide, to be laid on a seven inch sub-base of waterbound macadam, with a three inch top of asphaltic concrete twenty feet wide, the three inch top to consist of two courses of one and a half inch binder and one and a half inch surface mix and supported by earth shoulders five feet wide. The seven inch waterbound macadam sub-base was constructed by the same contractors during the year 1922.

Upon being awarded this contract the contractors immediately secured two quarries, the first known as No. 1 quarry, situated 1-3/4 miles westerly from the eastern end of their contract,



Rolling base course of spalls on soft bottom



Laying binder course

and the other known as No. 2 quarry, two and a quarter miles easterly from the western end of the contract. Two Acme crushers (one 11 by 18 inch and the other a No. 9 A.A.), two bins and two tractors, (the crushers being run by steam power) were installed side by side. This quarry work was sub-let to reliable men who were experts at this kind of work, the contractors having found from past experience that this was the most economical and efficient way to handle it. The agreement between the contractor and the sub-contractor was that the contractor would supply all plant, engineers and helpers and pay the sub-contractor at a rate per cubic yard crushed. The sub-contractor was to quarry, haul to and feed crushers and pay all labour necessary to carry on the work.

Cummer asphalt plant used on the Ottawa-Kingston highway

Men with the aid of teams and slush scrapers were started to construct the earth shoulders as it was necessary to keep this work ahead of the stone. Material was scarce owing to the fact that considerable solid rock prevailed within the right-of-way and that all earth ditching had been excavated to its proper grade the previous year. This scarcity caused very long hauling for scraper work, thus causing considerable delay in the progress with the shoulders and making the work far more expensive.

In the meantime, the waterbound macadam work was being pushed forward. Teams and trucks commenced hauling the stone from the quarry to the site where it was spread, watered and consolidated, two rollers being used for this purpose, each of the twelve-ton, three-wheel type .

As this part of the work was progressing the asphalt force were erecting platforms and placing the large Cummer asphalt plant close to a siding on the Canadian National Railway. This plant has a capacity output of 1,250 square yards of two inch material per day. Boarding and bunk houses were quickly erected close by. Cars of asphalt, crushed stone, sand, stone dust and coal were shipped in and unloaded. When the plant was ready to commence, five five-ton trucks were used for the hauling and unloading of the asphaltic binder and surface which was raked and levelled by expert rakers and then rolled by two rollers, one an eight-ton tandem and the other a ten-ton tandem. This material was spread between three inch planks supported by 3/4 inch drift spikes.

Upon the completion of the eastern end of the contract, the quarry equipment was moved on further to another quarry and operations were immediately commenced in order to have the base prepared in time for the topping after finishing the eastern end. The asphaltic plant at the eastern end of the contract was moved close to a siding of the Canadian Pacific Railway at the western end of the contract.

On the Dundas St. Provincial Highway at Tansley, Ont.

The large Cummer asphalt plant used by Dufferin Construction Co.

Unusual Sash Job in New Ford Factory

The steel sash used in the construction of the mammoth new plant of the Ford Motor Company at Ford City, is particularly worthy of mention, on account of the new and original features embodied in the design and control.

The scheme of lighting and ventilation briefly is this. A and M frames alternate on the roof with sawtooth frames. On the inclined slope of these frames are two, and in some cases three, rows of continuous top hung sash. The largest sash, six feet in height, occurs in the A frames. The other sizes occurring in the sawteeth and M frames are five feet in height.

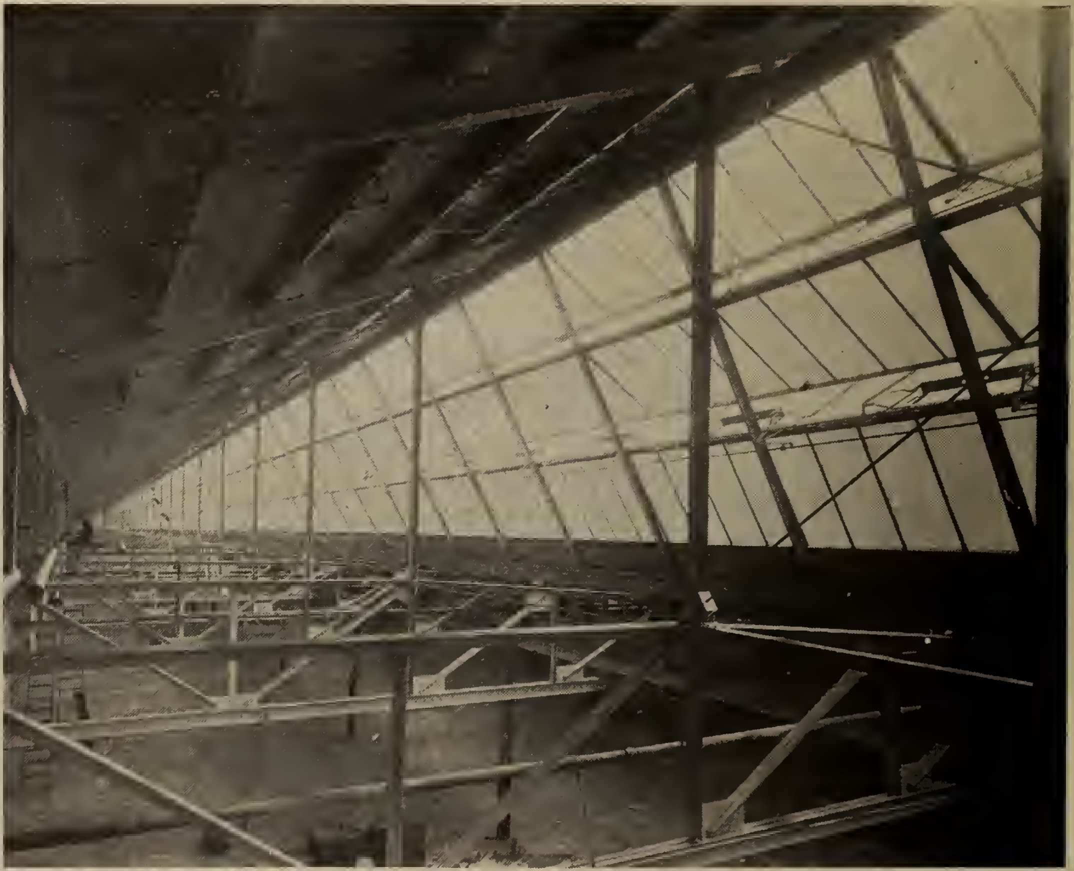
Continuous sash are used on the vertical sides of the three craneways. The sidewall proper of the building contains sidewall factory sash with horizontally pivotted ventilators controlled by electric power driven torsion operators.

The sash used are made with a continuous hinge at the top of the section which gives a satisfactory weather proof joint. The bottom section of the sash closes against a girt angle flashed with 16 ounce copper, so that it makes not only a good appearance but should prove as weather proof as could be desired.

The runs on the roof, 540 feet long, are operated in one section—the total length of run from one motor and one power. The tension type of operator as it pulls actuates movable arms which push the sash out to its extreme opening position.

The originality of the design is best seen in the system of control. All control wires were led to central points, one in the north half of the building and the other in the south half. These leads centralize in two control cabinets which control the windows facing east and those facing west, respectively. In each cabinet are sixteen switches which control the sixteen runs of sash in each elevation. Any one run may be operated by pressing the button, or all sixteen may be operated at one time by throwing in a master control which with automatic fingers engage all sixteen buttons simultaneously. Any one of the automatic fingers may be raised to prevent it engaging so that all windows may be operated at once, with one or more lines left closed. This flexibility of control is unique in as much as any desired combination may be secured with the greatest of ease.

These windows represent the last word in this phase of building construction, and it is gratifying to think that a Canadian company secured this contract and turned it out a "Made in Canada" job. It was handled by the Trussed Concrete Steel Co., Walkerville, Ont.



A 540 ft. run of steel, motor operated sash in Ford machinery shop at Ford, Ont.

Mixing plant at Isle Maligne power project of the Quebec Development Co. It has a capacity of 2,500 cu. yds., of concrete per day of 24 hrs.

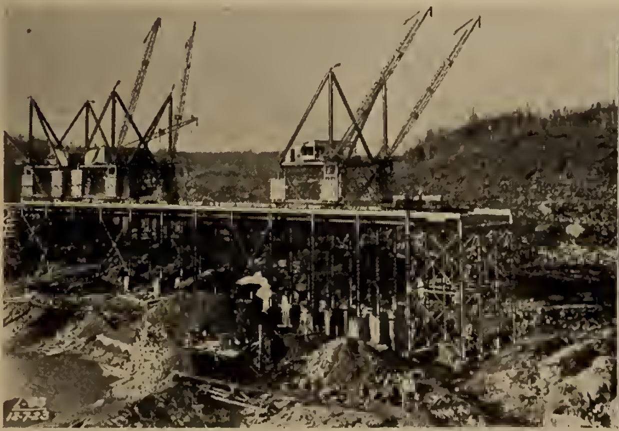
Upper Saguenay a Scene of Stupendous Construction Activity

Quebec Development Co., is Making Rapid Strides With Its Plant at Isle Maligne, Near Lake St. John—The Latest Photographs From the Job Show the Progress Made

The "Construction Review" number of the Contract Record would be very incomplete without some reference to the work being carried out by the Quebec Development Co. Ltd., in connection with hydro-electric power development on the upper Saguenay river, near Lake St. John, in the province of Quebec. The project which this company has under way is, when viewed from all angles, a stupendous undertaking and ranks with the Welland canal as one of the largest pieces of construction work being carried out in Canada today. Ultimately, somewhere in the neighbourhood of 1,000,000 h.p. will be developed from the Saguenay, half of this amount being the development expected from the works at present under construction by the Quebec Development Co., whose plant will be one of the finest on the continent.

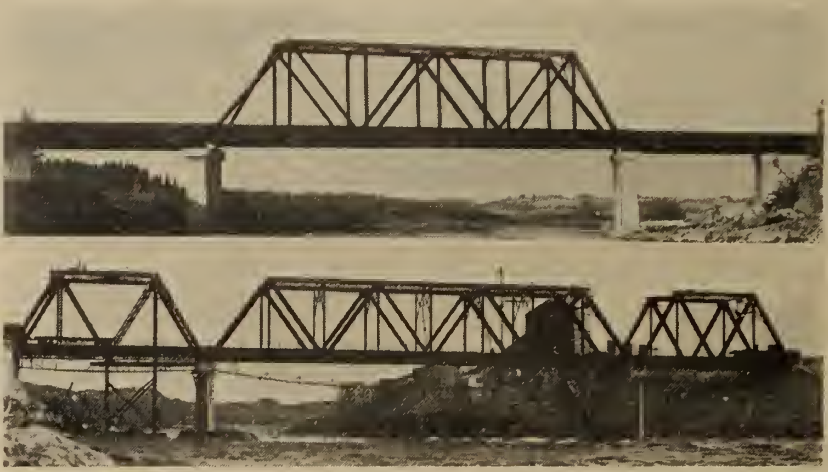
Lake St. John empties into the Saguenay river through two channels known as Grand Discharge and Little Discharge, which unite about nine miles from the lake, forming Alma island. In the Grand Discharge, about six miles from the lake, is a small island called Isle Maligne, at which point the Quebec Development Company's works are under construction.

The scheme involves a power house and dam on the Grand Discharge from Isle Maligne to the north shore of the stream, with three overflow spillways and a control spillway and also a second dam with three spillways on the three channels of the Little Discharge, thus control-



First half of 715 ft. 3-track steel contruction trestle on site of power house, with its three travelling cranes. Crest of finished power house will reach 80 ft. above track level

Second half of power house site. Level of water will eventually be about 100 ft. higher than that shown, backing waters up to Lake St. John, 9 miles away ling both branches of the lake outlet. A total development of 480,000 h.p. will be produced from twelve 40,000 h.p. turbo-generator units of the vertical type. The turbines will operate under a head of 120 ft.



Lower:—Double track crossing over right channel of Grand Discharge connecting Alma Is. yards to site of power house on Isle Maligne. Upper:—Crossing over right channel of Little Discharge, connecting Ste. Anne to main land. Another deck plate girder bridge of about the same length crosses the left channel connecting to Alma island.

About 500,000 cu. yds. of concrete will be involved in the whole project, 235,000 cu. yds. of this being in the power house, which will be 700 ft. long and 150 ft. high, and in the wing walls. A quarter of a million cu. yds. of rock will have to be excavated, this rock and that from the tailrace excavation and quarry being delivered by cars to primary and secondary crushers and then to storage bins of 1,000 cu. yds. capacity, and ultimately to the mixing plant. To handle rock and concrete during construction, a steel trestle, 55 ft. high, has been erected. This runs the full length of the power house and will afterwards become a permanent part of its equipment.

Construction work commenced at the beginning of this year, by the building of a cofferdam

1—General view of operations from a neighboring hilltop. 2—Site of the first dam and power house, looking toward the cofferdam. 3—"Jackhamers" drilling bench in quarry. 4—Drills are also in service in the quarry where large quantities of rock are being removed or rock-filled bulkhead, faced on the upstream side with planking. It was situated on the left bank of the Grand Discharge, a short distance above the power house site. This work was completed in April. Twelve miles of railway, with necessary yardage sidings, had to be built from Herbertville, on the Canadian National Railway, to the site, and bridges also had to be erected across the river. Illustrations of these accompany this article.

On the high bank of the river, overlooking the whole site, the company have erected offices, camp buildings and community house, all equipped with modern facilities and all intended to cater to the welfare of the personnel.

During this winter, construction work will proceed uninterruptedly. The erection of the upstream half of the power house will be carried out and a cofferdam built so as to permit the dewatering of the tail race site next spring. Tracks will be laid on Isle Maligne to enable the spillway dams to be built next year, when the power house is finished.

In connection with the construction operations compressed air equipment played an important part and through Mr. A. S. Bowman, B. Sc., the following information relating to that aspect of the work is furnished. For the earlier operations in connection with the cofferdam and railway extension, portable and stationary compressors, and pneumatic tools and rock drills were used. The portable compressor is an 8 x 8 inch gasoline-engine unit of 210 feet displacement. The stationary compressor is a combined steam-driven and power-driven machine of 340 feet displacement, supplied from 100-h.p. boiler. "Little David" wood-boring drills were used on the cofferdam; and "Jackhamers," were employed in excavating the rock.

The main air compressor plant, now in operation, consists of two synchronous-motor-driven, direct-connected, cross-compound compressors, of the clearance-control type, each having cylinders of 25 and 15¾ inches in diameter with 18-inch stroke and a capacity of 2,033 cubic feet of free air per minute. The motors are of 350 h.p. each, taking 3-phase, 60-cycle current at 2,300 volts. The rock-drill equipment includes drills mounted on tripods, besides the "Jackhamers" already mentioned. The drill steels are sharpened by two "Leyner" sharpeners after the drills are heated in "Leyner" oil furnaces. This whole compressed air installation, with its accessories, was manufactured by the Canadian Ingersoll-Rand Company, Ltd., at its works in Sherbrooke, Que.

To operate the construction machinery, power is being supplied from Kenogami until the first Isle Maligne unit is ready to furnish energy to complete the work.

The buildings seen in the foreground at the left of the trestle are the compressor house, the machine shop, and the sharpener shop

The officers of the Quebec Development Co. are: Mr. J. B. Duke, president; Sir William Price, Mr. W. S. Lee, and Mr. F. H. Cothran, vice-presidents. Mr. W. S. Lee, with offices at New York City and Charlotte, N. C., is chief engineer; and Mr. W. I. Bishop of Montreal is consulting engineer. The Quebec Development Company is doing its own work, Mr. Cothran being in charge of the work and Mr. D. F. Noyes is second in charge. Messrs. H. G. Cochrane and J. P. Chapleau are resident engineers, and Mr. S. F. McDougal is master mechanic.

For the illustrations accompanying this article, we are indebted to Mr. Cothran, vice-president of the Quebec Development Co. and to the Canadian Ingersoll-Rand Co.

Big Saving in the Cost of Large School Recently Completed in Hamilton

Careful Engineering Design Resulted in a 20 Per Cent Reduction in Cost—A Handsome Structure of 43 Rooms, the Largest Public School in Canada

By the adoption of a structural design based on sound engineering principles, about $2,000 per room was saved in the cost of constructing the W. H. Ballard school in Hamilton, Ont., reported to be the largest public school in Canada. Unfortunately, school design from a structural point of view has not generally kept pace with modern engineering practice, with the result that a great many of the school buildings erected in recent years, while modern, perhaps, with respect to their use as a medium of teaching, have not been erected with due regard for the economical use and disposition of the structural materials involved in their construction. Needless expense has, therefore, developed — expense that may easily have been saved, as has been evidenced in the case of the W. H. Ballard school, where the cost per room has been reduced about 20 per cent. from the cost usually estimated for buildings of the same character. On a 43-room structure, such as the Ballard school, a $2,000 saving per room means a very important economy that is worth far more than passing consideration. As has been intimated, the saving has been effected by a carefully engineered structural design, many important details of which will be brought out throughout the article.

The handsome entrance of the Ballard school, trimmed in Indiana limestone

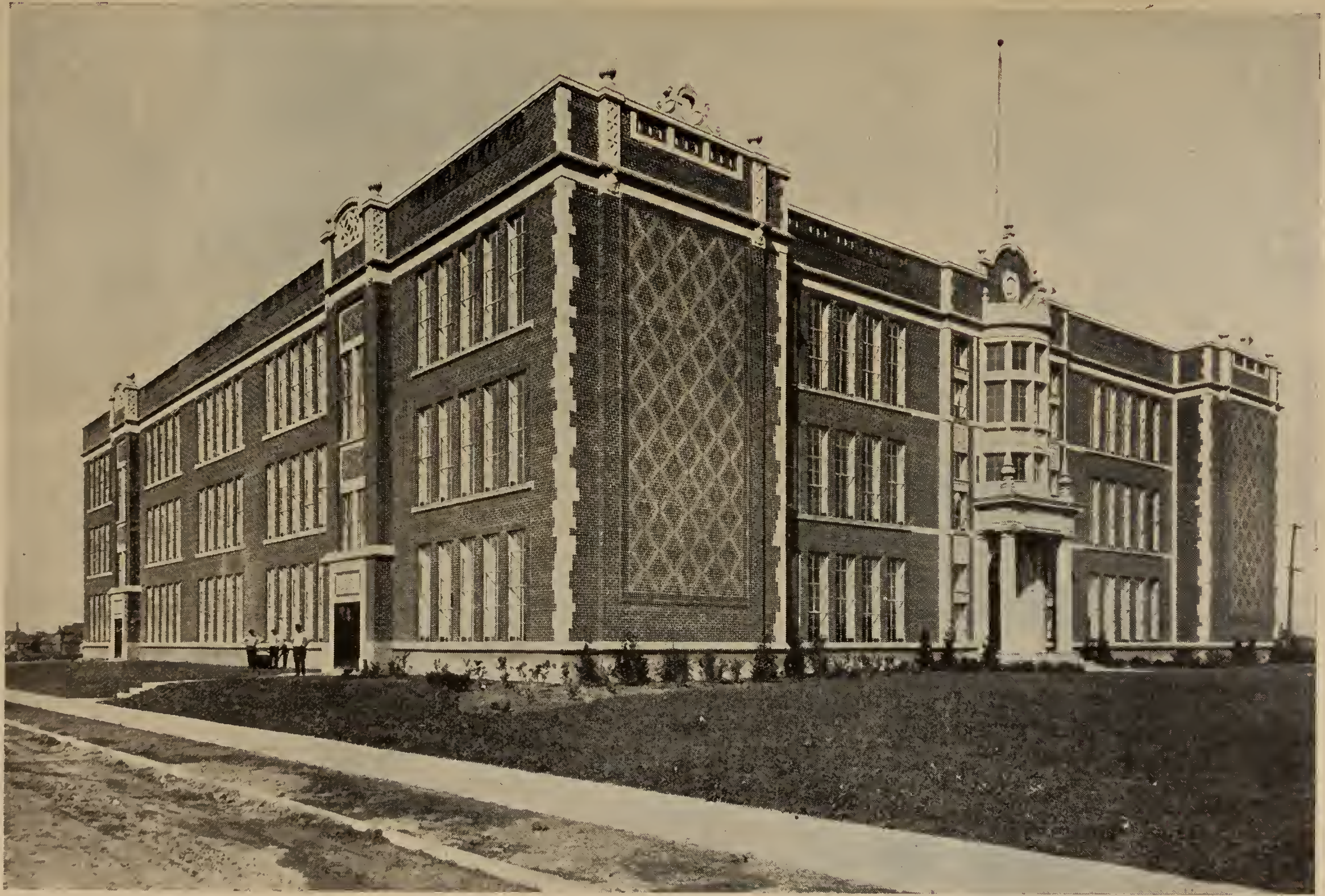
Architecturally Imposing

While economy has been attained in the cost of construction, architectural beauty and impressiveness have not been sacrificed to the slightest degree, but rather does the Ballard school stand out as one of the most attractive educational buildings in the Dominion. Milton rug brick, with Indiana limestone trimmings, are effectively combined to form a handsome exterior, designed in a modern adaptation of sixteenth century English Renaissance architecture. The main entrance, facing south on Dunsmure Ave., is especially rich with its Indiana limestone Doric columns, pilasters, entablature and semicircular bay window, reaching to the parapet. Cut stone has been used very liberally on the frieze, on parapets, in quoins and on the walls up to the watertable, and blends harmoniously with the brick work, which itself is rich in color and texture and laid in American bond with contrasting mortar. A relief from the massiveness of solid masonry is afforded on the end walls, where inset panels have been laid up in a herringbone pattern.

The school, which is named after Dr. W. H. Ballard, a distinguished Hamilton educationalist, has accommodation in its forty-three classrooms, inclusive of household science and manual training departments, for 2,000 pupils. The ordinary classrooms are fitted with moveable desks and are unilaterally lighted. One feature of the layout is an auditorium, 70 ft. by 80 ft., entered directly from the five outside entrances. The seating capacity is 1,400 and a stage, 42 ft. by 19 ft., with dressing rooms on either side, makes it available for a variety of purposes. The proscenium arch of the stage bears colored shields, emblematic of the Canadian provinces and British Colonies. This auditorium is lighted by means of a skylight, 18 ft. wide by 80 ft. long.

Other special rooms and departments include the principal's office, adjoining the main

Canada's Largest Public School
The W. H. Ballard School Hamilton



A 43-room school building in which a special engineering design reduced costs considerably entrance; the teachers' rest room, 19 ft. by 24 ft., with toilet and cloak room; dental clinics and nurses' room, each 25 ft. by 9 ft. 9 in.; library, 25 ft. by 13 ft. 6 in., lighted by the bay window over the front entrance; two gymnasiums, 25 ft. by 65 ft. each, with 18 ft. ceilings and walls lined to a height of 6 ft. with glazed brick; two kindergartens, divided by sliding doors and each fitted with a large bay window, fireplace, toilets and cloak room; and two shower rooms in the basement, one each for the boys and girls.

The auditorium of the Ballard school

The manual training and household science departments are located on the third floor, in rooms each measuring 25 ft. by 42 ft. Off the manual training room is a lumber storage room, 9 by 12 ft. and off the household science room is a pantry, 9 ft. by 15 ft.

On each floor is a separate boys' and girls' toilet room, 17 ft. by 42 ft., finished with terrazzo floors. These rooms have a separate exhaust fan to prevent foul air from escaping into the corridors.

Heating and Ventilation

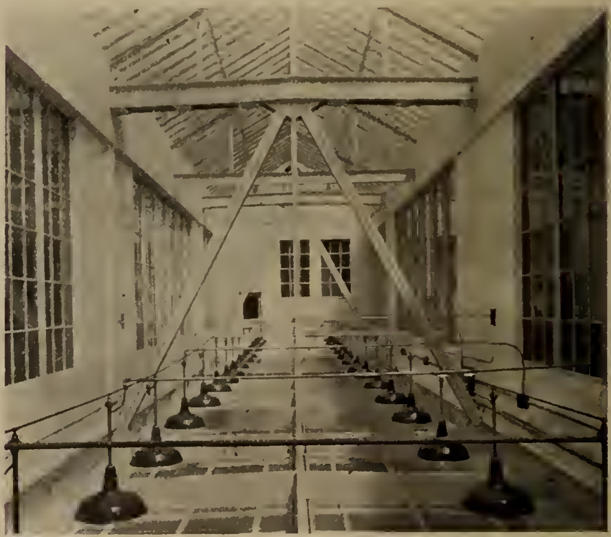
Under the north portion of the school only, is the basement. It contains the boiler room which is 25 ft. by 64 ft., with a ceiling 13 ft. high, adjoining it being the coal room, 36 ft. by 64 ft., with storage capacity for 300 tons of coal. The boiler room contains six No. 27 Spencer boilers with a total capacity of 60,000 sq. ft. of radiation. These boilers have hopper feed on top and are fed from an overhead bucket which is hand controlled. All ashes are removed by an electrically operated ash hoist. The boiler room also contains the sump pump for draining all water from the basement and pumping it to the sewer level, which is above the basement level. In this room are also the heater for domestic water, panel boards for electrical control and the steam circulating pump. The electrical transformers are contained in a fireproof room off the boiler room.

At each end of the boiler room are the two fan rooms, each containing a fan with a capacity of 40,000 ft. of air per minute. These fans are driven by 10 h.p. motors. The fan rooms also contain the heating coils through which the fresh air is drawn and then forced through ducts to classrooms and auditorium, etc. The apparatus for controlling the temperature of the whole school is contained in the east fan room.

A complete private telephone system has been installed by which the principal's office may be connected with any classroom, gymnasiums and boiler room.

Special Engineering Features

As has been mentioned previously, the engineering design of the building was so developed as to effect great saving in the cost of construction, at the same time being carefully adjusted to the plan which the architects had in mind. Owing to the large window spaces in modern schools, heavy loads are concentrated at certain points of the exterior walls, which condition is ordinarily taken care of by the use of relatively heavy masonry. In the Ballard school, however, steel columns were built into the exterior walls at points where heavy loads were concentrated, making it possible to greatly reduce the thickness of these walls. In one of the illustrations accompanying this article, the columns referred to may be very clearly seen, extending beyond the brickwork. So divergent was this design from the practice ordinarily followed, that it was only after convincing evidence from several engineers that the school authorities would accept the design, so much prejudice was there against any scheme that was different from the time-established precedent. In the interior walls, too, through which space had to be left for air ducts, considerable economy in the use of materials was effected and a stiffer wall obtained by properly designing the walls and incorporating the ducts in them, instead of by


Deep trusses concealed in the partitions above the auditorium are an economical feature of the design

using wasteful heavy bearing walls with additional masonry added to form the ducts.

The frame is of structural steel, while the floors are constructed of reinforced concrete, using steel "floor tile" which give the effect of beams at 2 ft. centres, with a 2 in. slab. Metal lath is secured to the under side of the beams and plastered for the ceiling. By this system, a light floor is secured with an air space that acts as a sound deadener.

Ordinarily, the roof slab of buildings of this type is made flat, the necessary slope for drainage being secured by means of a heavy cinder fill. In the case of the Ballard school, however, the 2 in. concrete slab forming the roof was laid to the correct slope. Any heavy fill was dispensed with and the desired flat ceiling was obtained by hanging metal lath horizontally from the steel roof beams. Not only was a warmer and lighter roof obtained, but lower cost also resulted.

Class Rooms Over Auditorium

Another interesting feature was the utilization of the space on the third floor, over the auditorium, for six standard classrooms. To do this economically, deep trusses were employed which carried the third floor on their bottom chords and the roof on the top chords. They were completely concealed in the partitions between the classrooms. The deep trusses were not only economical, but more rigid than if separate shallow trusses were used for the floors and roof. With the exception of the outside wall columns, all the steel work was made self-supporting, which allowed it to be erected rapidly ahead of the masonry work, thus avoiding delays and interference.

Another detail which is but typical of the care taken in the design, is the manner in which the hand railings for the stairs throughout the building were designed. Instead of the usual architectural iron balustrades, concrete slabs were used, which not only saved space and expense, but also acted as beams to carry the steps.

By dispensing with a basement, except at one end, considerable expense was saved. Only where the heating plant is located and where extra clearance for the gymnasiums was desired, was any underground work carried out. The cost was also reduced by abandoning the usual cloak rooms in connection with the classrooms. Instead, steel lockers have been installed in recesses along the walls of the corridors.

The school, which is of fireproof construction throughout, cost $380,000, exclusive of ground and equipment. This gives a cost of $190 per pupil, based on an accommodation for 2,000 or a cost of 25 cents per cub. ft. By dividing the whole cost among the 43 classrooms, without allowing for the cost of the auditorium, offices, rest room, clinics, boiler room, fan rooms, shower rooms, etc., the per classroom cost was $8,837.

The architects for the Ballard school were Warren and McDonnell, Home Bank Building, Hamilton. E. H. Darling, consulting engineer, Hamilton, was in charge of the engineering design. The general contractors were the P. H. Secord & Sons Construction Co., Brantford. The sub-contractors were as follows: Steel Co. of Canada, Hamilton, reinforcing steel; Hamilton Bridge Works Co., Hamilton, structural steel; Pedlar People Ltd., Oshawa, Ont., represented by H. C. Lefroy Engineering Co., Toronto, metal floor tile; Canadian Metal Window & Steel Products, Ltd., Toronto, steel sash; Roelofson Elevator Works, Galt, Ont., ornamental iron; Canadian Wire & Iron Goods Co., Hamilton, ornamental iron metal lockers; Patterson & Crosthwaite, Hamilton and Mickle-Dyment & Son, Toronto, millwork; Kent Garvin & Co., Hamilton, hardware, marble and terrazzo; A. W. Carmichael, Ltd., Toronto, roofing; Bird & Son, Ltd., Hamilton, roofing materials; Vulcan Asphalt & Supply Co., Toronto, mastic floors; Interlocking Tile Co., Toronto, interlocking hollow tiles; Ritchie Cut Stone Co., Hamilton, cut stone; Milton Pressed Brick Co.,Toronto, brick; Spencer Heater Co. of Canada, Ltd., Toronto, boilers; Adam Clark, Ltd., Hamilton, heating, ventilating and plumbing; Langslow Ltd., Cobourg, Ont., desks; B.C. Lumber Commission, Toronto, fir lumber; Porcelain Products, Toronto, plumbing fixtures; C. A. Dunham Co.; Toronto, heating specialties; Sheldons Ltd., Galt, fans; R Stamp, Hamilton, painting; Thos. Irwin, Hamilton, metal vent ducts.

Montreal Apartments Are Empire's Largest

The Drummond Court Apartments are Ten Storeys High and Built of Reinforced Concrete

The largest apartments in the British Empire, known as the Drummond Court Apartments, have recently been constructed in Montreal by Anglin-Norcross Limited.

The apartments are located between St. Catherine and Sherbrooke Sts., fronting on Drummond and Stanley Sts. and running parallel with the previously erected Drummond apartments. A space of 33 feet, however, has been kept between the old building and the new Drummond Court, running through from Drummond to Stanley Sts., preserving a street space practically in line with Burnside St.

The building is of reinforced concrete and is fireproof throughout. The exterior is Indiana limestone with brick and presents a very handsome appearance.

The structure is ten storeys in height with basement and has a frontage of 108 feet on Stanley and Drummond Sts. with a depth of 252 feet.

The main entrance and corridor running from Drummond to Stanley Sts. is impressively ornamental and has marble floors and trim.

Two passenger and two freight elevators serve the building, while 12 electric service lifts are also installed to make the service as near perfect as possible. Hardwood floors are placed throughout the building and each apartment has a living-room with an electric fireplace with marble facings and specially designed lighting fixtures.

There are 122 apartments in the building, 36 apartments of 9 rooms each and 3 bath rooms; forty apartments of seven rooms and two bathrooms; twenty-six apartments of six rooms and two bathrooms; and twenty apartments of five rooms and two bathrooms. Each apartment has a generous supply of closets and private telephones are installed in every instance to communicate with every apartment.

The Drummond Court Apartments, Montreal

A refrigerating system is operated from the basement giving each apartment a complete refrigerating set.

Two entrances serve each apartment, one being the main and the other the service entrance.

The ground was broken for the building on April 10th, 1923, and the first floor was erected on July 19th, 1923, and at the present date some of the apartments are now being occupied, thus making a record in rapid construction.

The architect was Mr. H. L. Featherstonhaugh, and the firm of Anglin-Norcross Ltd., Montreal, were the general contractors. Messrs. McDougall, Pease and Friedman, Montreal, were the mechanical engineers.

The elevators are of the A. B. See type and supplied by Darling Bros., of Montreal.

The cut granite for the base of the exterior was supplied by Messrs. Anglin-Norcross Ltd. themselves from their own plant at Iberville, P.Q.

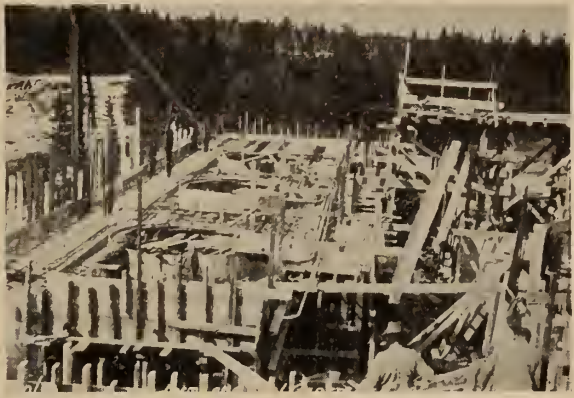
Face brick was supplied by National Brick Co., and terra cotta by the Montreal Terra Cotta Co.

Campbell Gilday Co. supplied the roofing, while plumbing and heating were furnished by W. G. Edge Ltd., boilers by Hall Machinery Co. and the refrigeration by Linde Canadian Refrigeration Co.

Other contractors and suppliers of materials were: Electrical work, the Canadian Comstock Co.; gas and electric stoves, the Montreal Light and Power Co.; cut stone, J. H. Hutchison; concrete piles, McArthur Co.; hardware, Durand Hardware Co.; reinforcing steel, Trussed Concrete Steel Co.; waterproofing, Douglas Bros.; ornamental iron, Montreal Architectural Iron Works; plastering, McNulty Bros.; tile work. G. R. Locker Co.; terrazzo, Jas. Walker Hard-

(Continued on page 1242)

The power site at Malay Falls


Forms and steel on generator floor

Nova Scotia's Latest Power Project

East River Sheet Harbor Development at Malay Falls is Rapidly Taking Shape—Nineteen Dams to Develop Storage—5,550 h.p. in Three Units Under a Head of 43 ft.

By K. G. CHISHOLM
Nova Scotia Power Commission, Halifax, N. S.

Development is being carried on at Malay Falls by the Nova Scotia Power Commission to supply the industrial district of Pictou County comprising the five towns of Pictou, New Glasgow, Stellarton, Westville and Trenton. This district, the most distinctly industrial on the mainland of Nova Scotia, has been adversely affected by high power costs for many years. Operating costs alone range from 1.65 cents per kw.h. in the efficient steam turbine driven plant of a large coal company to 10 cents and 12 cents in the smaller central stations and consumers' lighting rates range from 15 to 17 cents per kw.h.

Some means of bettering these costs has long been an important problem and since the investigation of East River Sheet Harbor in 1916 by the Dominion Water Power Branch, attention has been turned in that direction. It was not, however, until after the passing of the Nova Scotia Water Act in 1919 appointing the Power Commission with authority to take all necessary steps for actual development to meet just such situations as those existing in Pictou County, that attempts to bring development under way really began.

The Water Act was passed in May 1919 and on September 12th of the same year formal application under the Act for a supply of power was made by the Town of Pictou and was soon followed by similar applications from Westville, Trenton, New Glasgow and the municipality ot Pictou County. On May 22nd, 1920, the Pictou County Power Board was authorized by act of legislature to represent the various municipalities interested.

A very exhaustive investigation was at once begun by the Commission's engineers as to the requirements of the district and the best means of supplying them.

The annual consumption of electrical energy in Pictou County at that time was about 30,000,000 kw.h. of which three large industrial concerns, the Acadia Coal Company, the Nova Scotia Steel and Coal Company and the Eastern Car Company produced and consumed within their own plants some 24,000,000 kw.h. It was apparent, therefore, that for any considerable development such as would make the best rates possible, it would be necessary to secure these large users as customers. The Commission's estimates showed that 30,000,000 kw.h. could be developed at Sheet Harbor and delivered at the low tension side of substations in Pictou County at about 1 cent per kw.h. Upon refusal of the large concerns to contract, however, it devolved upon the engineers to find some means whereby the remaining 6,000,000 kw.h. annually could be delivered to the municipalities at a favorable rate. The best solution to this problem was finally decided to be a hydro-electric plant at Malay Falls on East River Sheet Harbor, on a much smaller scale than was at first anticipated and a contract based upon 5,600,000 kw.h. per year at cost was signed by the Power Commission and the Pictou County Power Board on September 7th, 1922, and approved by order-in-council of December 21st, 1922, some three years after negotiations began. The 5,600,000 kw.h. mentioned in the contract was afterwards increased to 8,000,000 kw.h. under the terms of the contract upon request received from the Pictou

County Power Board. The estimated cost of the power at the low tension side of the Pictou County sub-stations will be 1.38 cents per kw.h. for 8,000,000 kw.h. annually.

Preliminary construction work was commenced in the fall of 1922 and active work early in the spring of 1923. At the present time the development is within about two months of completion.

Brief General Description of River

East River Sheet Harbor has a drainage area of 234 square miles and flows into the Atlantic Ocean at the head of Sheet Harbor. It contains over 60 lakes varying in size from small ponds to 2.4 square miles in area. The power section of the river begins at Lochaber Stillwater, 5.5 miles from tidewater. In this stretch there is a total drop of 175 feet with the largest concentration at Malay Falls where a fall of about 20 feet occurs.

Showing typical foundation conditions at the storage dams

The power section of the river could be developed in several different ways depending upon the output required and the original scheme outlined by both the Dominion Water Power Branch and the Power Commission's engineers when a larger market was thought to be available considered utilizing the whole river in two developments.

As indicated herein, however, the exigency of the market in Pictou County necessitated a smaller development and Malay Falls was selected as giving the most economical development of the required output. The remaining power on the river will be developed in two successive increments. The first of these utilizing the 109 feet of head below Malay Falls is in fact to be commenced very shortly to supply a pulp and paper plant at tidewater. There will then remain undeveloped only 23 feet of fall above, which can be increased to 43 feet by the Lochaber dam and it is expected that this site known as the Marshall Falls site will be required in the future to meet the growth of the Pictou County load.

Run-Off and Storage

The very high run-off characteristics of Nova Scotia are again evidenced by this river which had a mean annual run-off of 39.61 inches for the seven years 1916-1922. The maximum annual run-off during this period was 45.53 inches in 1918 and the minimum 29.97 inches in the abnormal drought year of 1921. With the storage to be developed initially a dependable flow of 400 second feet will be obtained which can be increased to about 500 second feet by further storage should occasion require it.

The present development will utilize only six storage basins out of a total of seventeen available. All the dams are being constructed of timber or earth embankment. Nearly all of them are somewhat inaccessible and for the sake of economy the hauling in of cement was avoided and heavy construction plant kept to a minimum. Furthermore the timber required was available within short distances of the dams and a very considerable saving has therefore been effected through the use of timber construction. The gates for these dams are being made up at the respective sites with only the hoisting mechanisms brought in.

The storages which are being developed initially are listed below:

Site	Area in Acres	Regulation depth in feet	Capacity Acre feet
Lake Mulgrave,	1200	15	18,000
Ten Mile Lake	435	16	6,960
Governor Lakes	1600	8	12,800
Anti-Dam (flowage)	400	27	9,000
Sloane Lake	700	7	4,900
Rocky Lakes	600	22	13,200
		Total Storage	64,860

Counting wing dams a total of 19 dams are required to develop the above storage, the largest of which is Anti-dam with an overall length of 450 feet and a maximum height from stream to spillway level of 30 feet.

Efficient use of such a comparatively large number of scattered reservoirs will present a problem and to assist in operation the Lake Mulgrave dam, 5 miles from the intake, is being supplied with motor operated hoists to be controlled from the power house.

Generating Station Installation and Layout

The head dam situated at the head of Malay Falls consists of 170 feet of earth-fill corewall section, 33 feet of bulkhead section, 67 feet of sluice gate section containing four ten foot stop-log openings and approximately 300 feet of spillway. The south end of the dam forms part of the wall of the intake canal which is about 750 feet in length. From the canal the water flows through rectangular intake passages directly into the wheel pits which form the substructure of the power house. Three vertical lift gates are placed at the intakes so that the water supply to each wheel pit can be shut off independently.

Spillway level is at elevation 152 and by means of slight excavation below the falls a mean tailwater level of 109 has been secured giving a gross head of 43 feet which, because of the small hydraulic losses in the intake system, is practically the net head also, except for such drawdown of the head pond as operation demands. The machine installation consists of three open setting vertical Wellman-Seaver-Morgan turbines manufactured by the John Inglis Company of Toronto, rated at 1,850 h.p., 225 r.p.m. under 43 feet head. They are direct connected to 1,500 kv.a. 2,300 volt, Canadian Westinghouse generators.

The overall outside dimensions of the power house are 96 feet by 33 feet. The low tension switching equipment is underneath the switchboard gallery which is at the centre of the intake side of the building 4 feet above the generator floor. The three transformers for stepping up to 66,000 volts are at one end of the switchboard gallery with provision for a future similar installation at the other end for the Marshall Falls development when completed. They are set upon the lower floor so that their bushings are about level with the switching platform.

Steel plate draft tubes have been used with considerable saving in substructure costs.

The transmission distance is 44 miles to the main terminal station at Stellarton with another 11 miles to the town of Pictou's power house which is also being used as a substation. Fifty feet western red cedar poles are being used throughout except for the ½ mile submarine cable section under Pictou Harbor. The conductors are No. 2/0 aluminum cable, steel cored, stranded. A line voltage of 66,000 is used for the remaining 44 miles between the plant and Stellarton and 13,200 volts for the remaining 11 miles including the submarine cable section.

Distribution

It is expected that the system will be ready for the delivery of power early in 1924 although it is doubtful if the Pictou County Power Board will be in readiness to receive it that soon. Arrangements have not yet been completed between the Board and the Pictou County Electric Company, which Company distributes electricity for light and power in four of the towns and also runs a street railway system. Negotiations are now under way, however, which it is hoped will result in a satisfactory settlement between the board and the company and clear the way for the distribution of Sheet Harbor power in the district.

Personnel

The Honorable E. H. Armstrong, Premier of Nova Scotia is chairman of the Commission, Mr. K. H. Smith is chief engineer, Mr. Harold S. Johnston is hydraulic engineer and Mr. J. F. Lumsden, electrical engineer.

A 30,000 h. p. Plant on St. Francis River

Construction is Proceeding on Hemmings Falls Plant and Its Completion is Expected in 1925—Details of the Hydraulic and Electrical Layout

The Southern Canada Power Company Limited distribute power throughout the Eastern Townships of the Province of Quebec. Owing to the repeatedly increasing demand for power in this district a contract has been let to the Foundation Company of Canada Limited, Montreal, to construct a new 30,000 h.p. hydro-electric development on the St. Francis River one mile above the town of Drummondville, Quebec. The development starts out under particularly happy auspices in that the market will absorb practically all the output from the time the new plant begins operations.

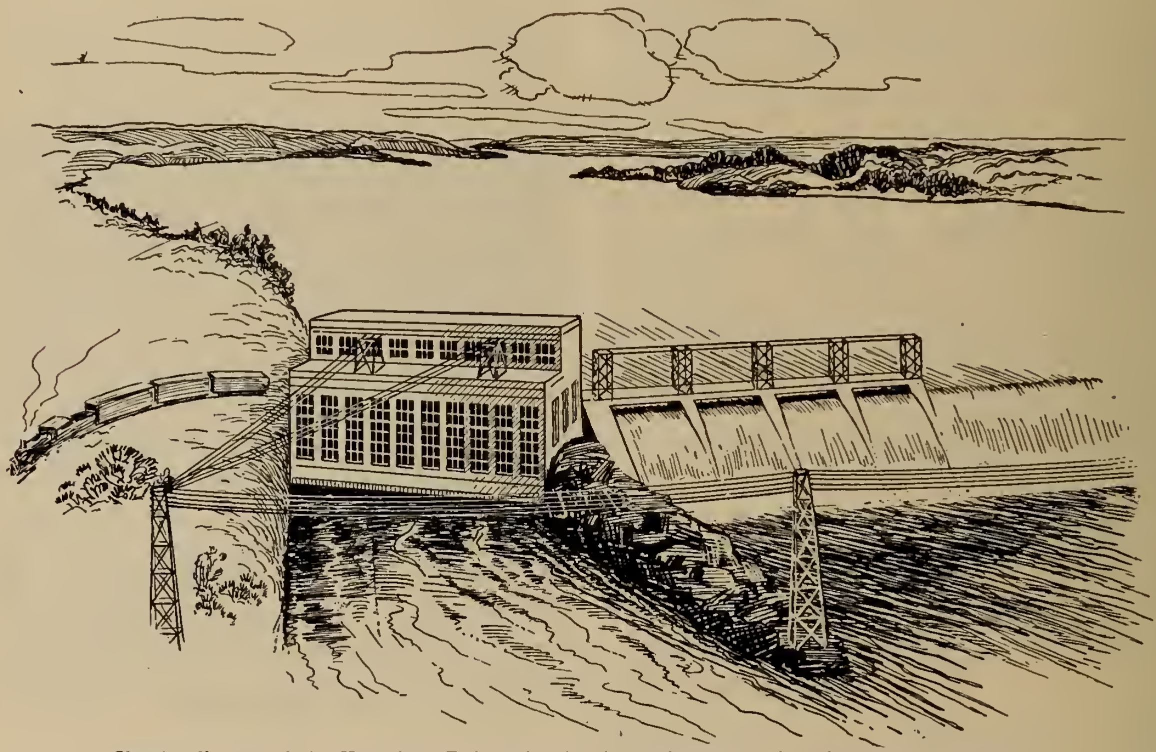
The development proper will consist essentially of a heavy gravity section main dam with power house at northerly end, and North and South wing walls. There will also be an earth fill dam with concrete core wall some 4,000 ft. long. The main dam will comprise a spillway section approximately 500 ft. in length, and sluiceway section including four sluice gates each with 50 ft. clear width and 20 ft. depth of water.

The power house which, in reality forms part of the dam, will be approximately 247 ft. long. It will contain six turbine-generator-transformer units rated at 6,000 kv.a., each feeding into a 48,000 volt transmission system. The turbines will be of vertical shaft type with Francis runners operating at 150 r.p.m. under a 50 ft. head of water. Each generator will be connected directly to a 6,000 kv.a. bank of transformers without low tension switches or bus-bars. The transformers will be water cooled and will step the voltage from 6,600 to 48,000 volts.

All switching will be carried out on the high tension side, 48,000 volt oil circuit breaker being provided on each transformer bank, one on each outgoing line and one between each unit and a transfer bus. Power for station services and local distribution will be provided through a bank of 48,000 v/2200v transformers connected to main transfer bus.

The switchboards and main control will be in the central section of the power house on an upper floor located between the intake room and the generator room. The transformers and high tension equipment will similarly be located between the intake room and generator room, the former being at the level of generator room floor and the latter on three upper floors on either side of and above the control room. The economy of this arrangement lies in the utilization of space necessary to ensure stability of the power house substructure.

The hydraulic lay-out will include three ice sluices, one to each pair of units so located as to facilitate removal of ice and debris. These sluices, with intakes at the racks, will pass through the power house substructure and discharge below the tailrace water level.



Sketchy diagram of the Hemmings Falls hydro-electric development as it will appear on completion

The dam will create a storage pond extending several miles up river. The storage in this pond will permit of regulating on a weekly load factor and will work to the benefit, not only of this particular plant, but also of the existing plant which the company operates at Drummondville and of future plants to be constructed further down the river at power sites controlled by the Southern Canada Power Company.

Surveys for the two and one-half mile connection from the main line of the Canadian National Railway to the power site were commenced in September 1923 and construction started immediately. The contractors operate this spur and all materials are transported to the work over this line. Plant installation is nearing completion; practically all the plant will be electrically driven. Concrete will be mixed in a central plant using rock excavated from the work and imported sand.

The cofferdam across the tailrace has been constructed and excavation commenced. The concreting of the north wing wall is also under way.

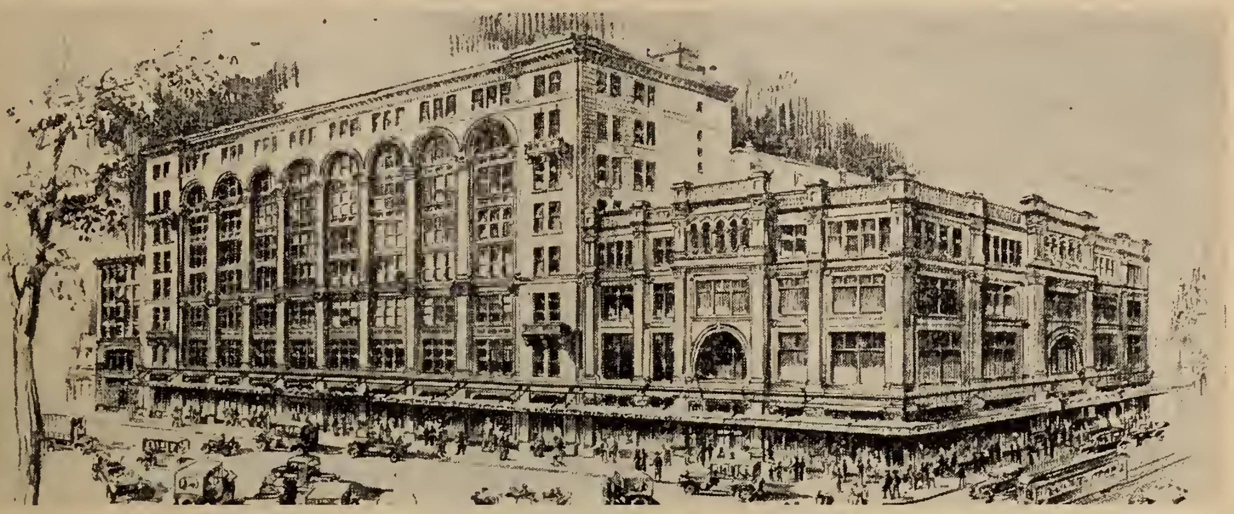
The completed development is to be handed over by the contractor early in 1925. The design of the plant is in charge of J. S. H. Wurtele, plant manager of the Southern Canada Power Company Limited. The construction work is being carried out by the Foundation Company Limited, Montreal.

Contracts so far let are for the turbines being built by the Dominion Engineering Works, Lachine, P. Q.; generators and transformers by the Canadian General Electric Company, cement by the Canada Cement Company, and reinforcing steel by Canadian Tube and Iron Company Limited, Peck Rolling Mills Limited, and Steel Company of Canada, of Montreal.

Montreal Apartments Are Empire's Largest

(Continued from page 1238)

ware Co.; interior marble, Wallace Sandstone Quarries; painting, Goodwins Ltd.; glazing, Pilkington Bros.; electric fixtures, McDonald and Willson Ltd.; woodwork, Wm. Rutherford Sons Co.; medicine cabinets, Denman and Kilgour.



The Henry Morgan and Co's. store in Montreal

196 Days Completed Henry Morgan Store

Speedy Erection Characterized the Recently Opened Addition to Montreal Departmental Shop—A Building that Involved Many Unique Construction Features

In the erection of the new store of Messrs. Henry Morgan & Co. Limited, Montreal, records in construction were established. The concrete frame of this large building was erected in 55 working days and three floors were raised in 14 days, which are two notable feats in quick concrete building.

The new building, which adjoins the old building on St. Catherine St., has a frontage on Union Ave. of 350 feet and a depth of 146 feet to Aylmer St.

The architecture is in classic style, suggestive of the Byzantine period, noticeable in the capitals of the lower order, and those from which the arches turn.

The Union Ave. side begins with massive piers, separated by large show windows with their polished granite trim. The lower storeys, while forming the lower order with a pylon at each end, preserve the horizontal lines of the parent, original building and present a modern interpretation of its grace and beauty, and forms the base to a massive arcade with eight huge arches extending from the fifth to the eighth floor.

The eighth storey is finished like the pylons and forms the upper frame enclosing the central portion. This is crowned with a cornice of unique design which, in a modified way continues around the building.

The schedule which called for rapid erection made it impossible to get native stone or stone from quarries nearby to match the stone in the original building, which is largely Corse Hill Scotch red sandstone, and arrangements were made with the Canadian Benedict Stone, Ltd., Montreal, to make, cut and erect the red sandstone for the entire new building.

The reinforced concrete structure is of the most modern type and is faced with stone that harmonizes with the original building.

The new building is 8 storeys in height and rises 130 feet above the street level. The ground floor area is 34,400 square feet and the total area of the new building is 309,600 square feet. The floors are 19 feet in height. The new show windows are each eight feet in height by 20 feet in width.

In the construction a considerable amount of marble has been used. The inside pillars finished in green marble are very beautiful. The Lepage Marble Works, who furnished the various marbles used, also furnished and set up the tiles, and the slate and marble treads used on stairs and landings.

An interesting feature is the roof erected by Geo. W. Reed & Co., Ltd., the main section having a heavy asphalt surface specially suited for recreation purposes such as tennis, while the pent houses and canopy are finished with heavy slate, laid flat in a bed of asphalt. This type is something new in roof construction and makes a splendid promenade. It is proof against the elements and against heavy foot traffic.

In designing the roof the architects had three points in mind: First, to provide the best possible covering for the building; second, to have the main roof constructed in such a manner that it would be suitable for tennis courts, etc., and third, to have the canopy and pent houses roofed with a type of roof suitable for foot traffic, as these were to be used for observation purposes.

The building is heated from a plant erected across Aylmer St. opposite the main building. This building also houses the transformer room.

One hundred and sixty-four thousand bags of cement were used with 29,000 tons of crushed stone and 16,200 tons of sand, to make the concrete, while to furnish the necessary reinforcement 320,000 pounds of steel were needed.

The bricks used were 2,500,000 ordinary and 200,000 face bricks for special use.

The architects were Barott & Blackader, of Montreal; the structural engineers, Purdy and Henderson, Montreal; mechanical and electrical engineer, Alex. Wilson, Montreal, and structural engineer of the power plant was W. H. Wardell, Montreal.

Henry Morgan & Co., Limited, were themselves the general contractors, operating through the extensive facilities of their factories and supplying the following trades: Foundation work, concrete structure, plumbing and heating, interior trim and wood paneling, carpentry, plastering and painting.

An interior view of the Henry Morgan & Co's. store

The following were among the principal contributing companies: A. C. Leslie & Co., Anglo-Canadian Wire Rope Co., Asbestos Products Co., of Canada; British Empire Steel Corpn., Canada Cement Co., Canada Wire & Cable Co., Canadian Benedict Stone Ltd., Canadian General Electric Co., Canadian Ingersoll Rand Co., Canadian Welding Works, Dominion Radiator Co., Dominion Bridge Co., Durand Steel Lockers, Geo. W. Reed & Co., Gourock Ropework Export Co., Hyde & Sons, Mussens Limited, National Brick Company of Laprairie.

All plumbing fixtures were supplied by Jas. Robertson Co., Ltd.; architectural iron work was supplied by John Watson & Son of Montreal Limited.

Lepage Marble Works Ltd. supplied all marble used.

The boilers and heating plant were put in by L. E. Moulton & Co. Ltd.

Morrison Quarry Co. supplied the crushed stone and O. Limoges & Fils supplied all the lime used.

The entire 12 elevators were supplied by Otis-Fensom Elevator Co.

The metal concrete forms came from Pedlar People Limited.

Pilkington Bros., of Canada Ltd., supplied all the glass used.

All the sprinklers were supplied by the Worcester Fire Extinguisher Co. Ltd.

H. A. J. Aldington, of Toronto, supplied the Delaurier steel forms for columns.

J. & J. Taylor, Toronto, put in the extensive safety deposit box system.

Revolving doors were supplied by R. A. Sproule & Son, Ottawa.

Boilers were obtained from Goldie and McCulloch Co., Galt, Ont.

American Chimney Corp., New York, put up the chimneys and The Lamson Company, of Boston, Mass., put in the conveyor system.

Montreal's Newest Office Building—The Keefer

The Largest of its Kind Erected in the Uptown Shopping District—To be Completed in February

The new Keefer building erected at the corner of St. Catherine and MacKay Streets, Montreal, embodies all the features of a large modern office building and is, by far, the largest of its kind to be put up in the west end of Montreal's uptown shopping district.

Operations were commenced on the new building on July 15th and it is to be ready for occupation by Feb. 1st, 1924.

The building is a ten-storey structure with basement and is of reinforced concrete and brick, and is fireproof throughout. It contains 1,500,000 cubic feet of space and has a floor area of 133,000 square feet. The frontage on St. Catherine St. is 120 feet and on MacKay St. 125 feet.

The front presents a good appearance and is of Benedict grey limestone and Kitanning face brick. At the top is stone trim with ornamental metal cornice. The fire escape is built in a court attached to the building.

The main entrance is trimmed in marble of handsome description, being supplied and put in by the Lepage Marble Works, who also did the marble work and marble trim throughout the building.

The electric lighting fixtures will be the most modern type and will be put in by McDonald and Willson Co., Montreal.

The general floor throughout will be cement finish, the elevator hall will have terrazzo floor. Three elevators of one gear, traction, two-speed, alternating current type, along with an electric ash hoist at the rear, have been installed by the Turnbull Elevator Co. The building is equipped with a mail chute installed by the Canadian Cutler Mail Chute Co., Montreal.

The heating plant, located in the basement, is served by two 85 h.p. Robb water tube boilers and has a radiation of 16,400 sq. ft., supplied by Taylor Forbes Co. and installed by the Garth Co. In the plumbing 188 fixtures are used and were supplied by the Porcelain Products Co. of Toronto and installed by the Garth Co.

Other firms interested were: ornamental iron, Architectural Bronze and Iron Works, Toronto; roofing, Geo. W. Reed & Co.; electric wiring, J. A. Anderson & Co.; plastering, Interprovincial Plastering Co.; glazing and painting, Alexander Craig Ltd.; cut stone, Canadian Benedict Stone Ltd.; steel smoke stack, The Dominion Bridge Co.; excavation work, Minogue Trucking Co.; wood trim, Knight Bros., Burks Falls, Ont.; metal windows and doors, Douglas Bros.; window sash, Jas. Davidson Sons, Ottawa; face brick, Webster & Sons; common brick, National Brick Co.; cement, Canada Cement Co.; terra cotta and partition tile, the National Fireproofing Co. of Canada; reinforcing, the Burlington Steel Co.; hardware, Jas. Walker Hardware Co., Ltd.; gypsum tile, Ebsary Gypsum Co.; valves, Jenkins Bros.

The general contractors for the building were Messrs. Thompson-Starrett Co., Ltd., who did all their own masonry, concrete and brick work. The architects were Messrs. Ross and Macdonald and Mr. W. J. Armstrong was the mechanical engineer.

The Keefer building, Montreal

Speedy Erection of Hamilton Building

Concrete Frame of Seven Storey Office Building Poured in 37½ Working Days—Adjoining Structures Required Extensive Underpinning and Bracing—Special Street Protection

Speedy pouring of the concrete frame was the outstanding feature of the construction of the new Lister office building in Hamilton, Ont., which replaces a building of the same name destroyed by fire about a year ago. Only 37½ working days were required for the erection of the seven storey skeleton, involving 3,000 yds. of concrete, an achievement which demanded efficient organization on the part of the contractor and close co-operation with the firms supplying materials. In addition to the speed record, the building is further unusual from a contracting point of view on account of some difficulties experienced with the buildings adjoining the site, which were more or less affected by the fire. This entailed the adoption of special measures to render these adjacent structures secure during the construction of the new building.

The new Lister building, situated in the heart of Hamilton, at the corner of James St. North and King William St., will be, on completion, one of the handsomest office buildings in Ontario. Architecturally imposing and structurally fireproof, it will be a splendid addition to the growing number of substantial buildings in the city of Hamilton. The exterior will be carried out in terra cotta for the first two storeys, dark brown tapestry brick above, liberally trimmed with cream terra cotta, which, with copper spandrels below the windows, will make a very attractive appearance.

In design, the structure is fireproof, concrete being used throughout for the frame. Reinforced flat slabs on girders carried by square columns form the general design. In plan, the building is an inverted F shape above the first floor, the latter being rectangular.

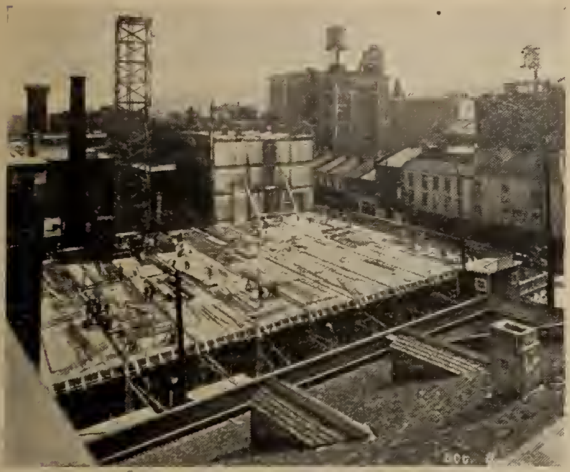
After the ruins of the burned building were removed and the site was cleaned by the general contractors, the Pigott-Healy Construction Co., the old buildings adjoining the site were thoroughly underpinned and their walls patched up at places where the effects of the fire were noticeable. The foundations of these buildings were of stone masonry but on examination, it was found that the mortar had been devitalized by the intense heat, necessitating new foundations to carry the loads. Considerable underpinning was therefore carried out by needling under the walls at intervals of a few feet and building up brick foundation walls bearing on firm clay. When these sections of wall were completed and the loads carried on them, alternate needles were driven and the same procedure followed until the whole building was adequately underpinned. Considerable sections of the exterior walls had to be patched up also with new brick masonry as the old brick and mortar had been too seriously affected by the heat of the fire.

In working on these old buildings in this way, the contractors were operating to a large extent in the dark as very little was known about the manner in which the loads were carried. Inasmuch as the buildings were comparatively old, the factors governing their design were unknown and, as subsequent examination indicated, the design was not in accord with modern practice. For this reason, the contractors were compelled to proceed warily with any reconstruction work.

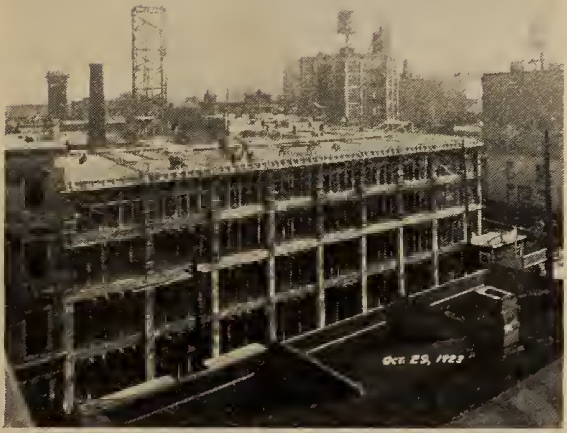
This illustration shows the method of needling under the walls of an adjoining building in order to renew the foundations

Adjacent Buildings Required Bracing

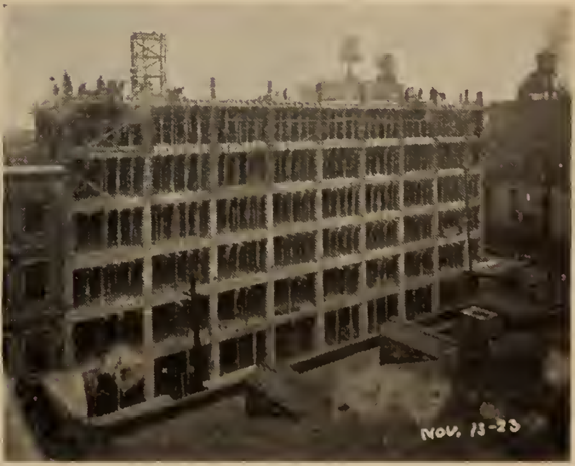
As an illustration of the difficulties they faced, reference might be made to a serious situation that developed during the removal of a wall section in the building facing on King William St. immediately east of the site of the new structure. This building had 9 in. brick bearing walls and and bearing partitions throughout, with the floor loads carried on wooden joists. In plan, there was one feature, which, while ordinarily not worth consideration, had in this case an important bearing on what subsequently developed. This was the fact that the west and north walls of the building did not meet at right angles but were joined by a narrow section of diagonal wall, perhaps not over 10 feet in width. From all appearances this narrow section of wall was carried, as were the other walls, on solid masonry footings. It was intended by the owners of the new building, who also owned the adjoining building referred to, to provide access be-



As indicated in the article opposite, unusual speed was attained in the construction of the Lister building in Hamilton, Ont. With clock-like precision, the Pigott-Healy Construction Co. commenced the pouring of a new floor every Monday morning, completing the seven storey frame in 37½ days.



The views illustrate the progress of construction at intervals of two weeks. On September 21 the first floor was ready for pouring and on November 13 the roof was in place—an achievement which was made possible through the excellent organization of the construction forces.



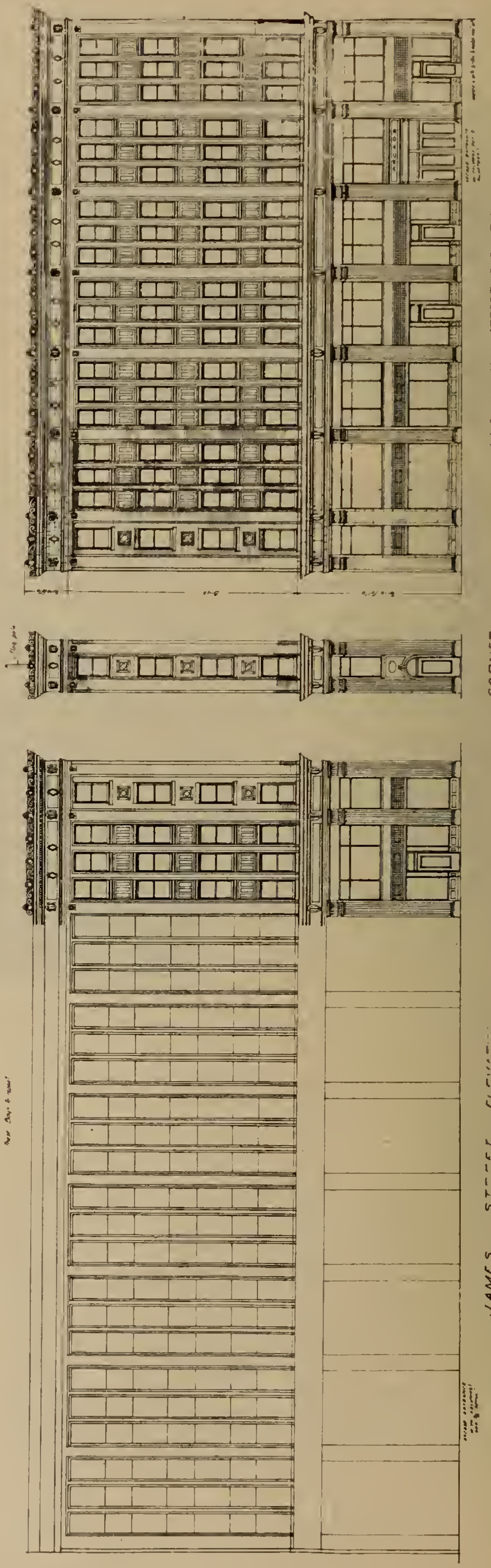
tween the two by removal of a section of wall on the ground floor close to this diagonal wall. The contractors decided, however, to remove the section of wall for the full height of the building, on account of the effect the fire had had and to rebuild a new wall from the first storey up. It was found, however, that the diagonal corner wall, instead of being carried on the masonry footing, was cantilevered between the north and west walls. Consequently, the removal of the section of west wall adjoining the corner wall destroyed the one abutment of the cantilever and placed the weight on the old stone foundation which buckled under the load. Collapse followed, the floors sagging free, supported only by the front wall and the first bearing partition to the east.

Immediate efforts were made to relieve the weight of the floor system so as to prevent collapse of the whole structure. By means of a gin pole the floors were jacked up to the horizontal, the front wall of the building, facing on King William St. being first trussed against outward buckling by means of a triangular timber truss braced against the curb on the opposite side of the street. After the floor loads were transferred to the gin pole, the collapsed bay of the building was entirely removed up to a partition wall, which was trussed against the possibility of failure by a system of vertical and inclined struts bearing on horizontal timbers, these latter being tied by means of cables to corresponding timbers on the opposite side of the building. The timbers were left in place until the concrete for the new structure was poured, after which they were sawed off and removed.

As has been intimated, the outstanding feature of the construction of the new building was the speed with which the concrete frame was poured. Seven full storeys, involving 2,911 cu.-yds. of concrete were erected between September 21 and November 13, a total of only 37½ working days when Sundays, holidays and days of bad weather are eliminated. This record was achieved not so much by any unusual plant as by the excellent organization of the contractors' forces and their close relationship with the supply people.

The Concreting Plant

As a matter of fact the concreting plant was very simple. A 3/4 yd. electric driven Smith mixer, located in the basement, discharged the concrete into a bucket which was elevated in a tower to the floor where it was required. Distribution was by buggy, no chutes at all being employed. The concrete aggregates were stored in a two compartment hopper at ground level, the mouth of the hopper being opened to either the stone or sand bin as required by means of a pivotted metal-covered baffle board. From these bins, which were really open piles, the material was barrowed to the side loader of the mixer. The cement was stored in the basement beside the mixer. Owing to the lack of sufficient stor-



The elevations of the Lister building, Hamilton, Ont., indicating the finished appearance of the building age space to enable a surplus of materials to be accumulated, the firm supplying the cement, sand and stone—Doolittle Russell Ltd.—had to give practically 24 hr. service, when concreting was in progress. Much credit is due to them for their share in keeping operations moving smoothly.

The pouring of concrete was kept continuous from the time a floor was started until it was finished. The regular procedure was to commence the pouring of a floor every Monday morning at 7 o'clock, which program was strictly followed except during one week when Thanksgiving Day necessitated the commencement of work on Tuesday. For the purpose of carrying out this plan of continuous operation, the working force was divided into night and day shifts. It is interesting to note that cost figures kept during the progress of the job showed that the unit cost of pouring decreased with each succeeding shift, indicating to what extent repetition of the same operation leads to improved efficiency. The last floor, for example, involving 300 yds. of concrete, was poured between 7 a.m. and 9 p.m. of the same day, a very remarkable record.

The form work, of which there was 160,000 ft., comprised floor panels, 3 ft. by 12 ft., of 7/8" tongue and groove material, and 4 x 4 in. joists, purlins and shores. About four complete sets were required to do the seven floors of the building. There was nothing unusual about the reinforcing steel of which 250 tons were employed.

Special Method of Street Protection

An interesting detail in connection with the construction was the manner of street protection, a complete description of which will be given in a subsequent issue. Briefly, however, the excavation was protected by planking held by two ledger timbers and batter posts located so as to leave column locations clear. The footing for the first two rows of columns around the building were dug, forms placed and concrete poured. After ten days the columns were stripped and each pair of columns was braced with timbers, one horizontally at the bottom and one diagonally from the bottom of the rear column to the top of the front column. Blocking was placed between each column and the two ledger timbers holding the sheeting. The batter posts were then removed leaving a clear space for forming, pouring, stripping and waterproofing the walls. The space in front of the walls was backfilled up to the first ledger timber, when it and the blocking at that level were removed. The second timber and its blocking were likewise removed when the backfill reached that level. Finally the sheeting was removed by means of a tripod and tackle.

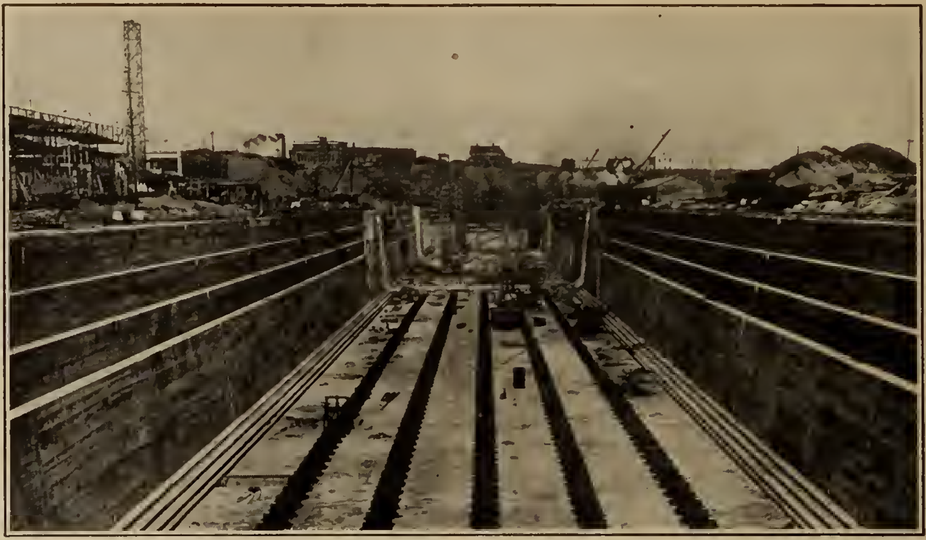
Another interesting feature of the job will be the fact that the floors will have no superimposed finish but will be of concrete ground to a glazed finish.

The architect for the Lister building is Bernard H. Prack, 50 Bay St., Toronto, and the general contractors, the Pigott-Healy Construction Co., 36 James St. S., Hamilton, for whom Mr. T. J. Crocker is superintendent. Sub-contractors and suppliers of materials are:—Doolittle Russell Ltd., Hamilton, cement, stone, sand; Burlington Steel Co., Hamilton, reinforcing steel; Frost Steel & Wire Co., Hamilton, steel spirals; Hobbs Mfg. Co., Ltd., Toronto, glass; National Fireproofing Co. of Canada, Toronto, hollow tile; F. G. Roberts & Co., Toronto, painting; Wood Electric Co., Toronto, electrical work; Hill Bros., Hamilton, plastering; W. Newell, Hamilton, plumbing; Drake-Avery Co., Hamilton, heating; G. & J. Inrig, Hamilton, roofing and sheet metal; marble and tile, Kent Garvin and Co., Hamilton; structural steel Hamilton Bridge Works Co.; miscellaneous iron, McGregor & McIntyre Ltd., Toronto; fire doors, A. B. Ormsby Co., Toronto; millwork, Consumers Lumber Co., Hamilton; cut stone, A. Stead, Hamilton; architectural terra cotta, Federal Terra Cotta Co., New York.

Duntile Co. Build Plant

The Duntile Company, Limited, have erected a standardized Duntile plant at Clanranald Ave., and C. P. R. tracks, Montreal, and opened an office and sales room at 499 Phillips Square. Since starting operations the company have experienced demand for the various sizes of tile for practically all kinds of construction, including residences, apartment houses, private and public garages, factories and office buildings. Duntile is made by moulding plastic concrete under tremendous centrifugal pressure in special patented machinery which produces a light weight unit of great strength. It is steam cured. Standardized machinery and equipment, standardized buildings and plant lay-out, enable the company to produce a high grade building unit at a low cost. Glazed Duntile is produced in various beautiful colours. The basis of the mixture used in glazing Duntile is the same as the product itself—Portland cement. It is applied under heavy air pressure immediately after the tile comes from the production machine. At this time the concrete is still plastic; hence the surfacing material is forced into the tiny pores of the tile and the two set and harden together; in effect, they become a single mass and are said to be almost unbelievably hard and flint like.

"Mechanical Stoking" is the title of a practical treatise on the essentials of machine stoking and the construction and operation of mechanical stokers, by David Brownlie, B.Sc., London, Fellow of the Chemical Society, London. It is calculated to be of special interest for factory owners and managers, engineers, mechanics, boiler attendants, and students. Published by Sir Isaac Pitman & Sons, Limited, London; contains 230 pages, size 4 x 6; cloth covers and well illustrated.



Interior of the St. John dry dock as the structure appeared shortly before its completion

Completion of the St. John Dry Dock

On October 29 the Official Opening of Large Marine Enterprise Took Place—Will Efficiently Take Care of the Repair Requirements of the Largest Vessel Afloat

What is the largest and best equipped dry dock on the Atlantic coast, unsurpassed in design by any in the world, was opened officially at St. John, N. B., on October 29. This event was the culmination of eleven years of effort, during which time the people of eastern Canada have looked forward with pride to the day when they could boast of dry dock accommodation capable of handling the largest ships afloat. Begun originally by Norton Griffiths Co., work on the dock ceased during the war, only to be taken up again in 1918 by the St. John Dry Dock and Shipbuilding Co., who relieved the former contractors.

The dock which is situated on Courtenay Bay, has an overall length of 1,150 ft. The clear width at the entrance is 125 ft. with 42 ft. of water over the entrance sill at extreme high tide. The dock is provided with an intermediate sill which will permit the whole dock to be divided into two entirely separate docking chambers, the inner chamber being 500 ft. in length and the outer 650 ft. in length. By this arrangement, the dock will take two moderate sized vessels and it can still be utilized, as occasion arises, as a single docking chamber with sufficient capacity to take the largest vessels afloat today.

The whole undertaking, exclusive of dredging the entrance channel—which has a minimum depth of 22 feet at low water, has cost $5,500,000, and was carried out by private Canadian capital under the terms of the Federal Dry-Dock Subsidies Act by which the Federal government pays the company an annual subsidy of 4½ per cent of the value of the dock for a period of 35 years. After that the company must operate without further assistance.

Concrete was used throughout for the construction except that granite was employed to form the outlines of the stops in the outer entrance and the inner sill, for the reception of the floating caisson, where wear will be heavy. As the dock will be dry most of the time, no special provision was made to guard against salt water action except by careful mixing and placing of the concrete and the use of a richer mix for those parts that are more or less constantly under water.

In design, the dock follows the most modern tendencies, based on a thorough study of dry dock requirements and shipping practice and needs. In cross-section, only three altars are provided; two of these are 2 ft. 6 in. wide and the third and lowest is 3 ft. wide. This arrangement was determined upon as being most suitable for modern ships and present day repair practice. A rectangular tunnel, originating in the pumping station and extending completely around the dock to a point opposite the pumping station, is located directly below the top of the way and provides for pipe lines through which water, air and steam are distributed. The electric cables are carried in fibre conduits in the concrete, directly in rear of the tunnel, with pull boxes every 50 ft., opening into the tunnel. By this manner of distribution, all the requirements in the way of electrical energy, water, compressed air and steam are provided at all points in an entirely unobstructive manner.

All the dock operating equipment is direct motor driven, using 550 v., 3 phase, 60 cycle, alternating current. For the pumping station, 2,465 h.p. is required. Capstans, sluice gate valves, caisson unwatering pumps and lighting are other phases for which electrical energy is required. By careful arrangement of the feeder cables, they are kept to a minimum size and maximum protection is offered against service interruptions.

The dock is lighted by means of flood lights arranged in two groups, one for lighting the dock chamber and one for illuminating the top of each dock wall and working area in rear.

An intercommunicating telephone system will be accommodated in one of the distribution conduits, with outlets for attaching portable telephones at control points such as the pumping station, the different valve recesses and the floating cassion, so that the dock master can communicate directly with any of his assistants or operators from any point about the dock.

Compressed Air Equipment

The air requirements of the dock are taken care of by means of two 22 x 14 x 16 in. Canadian Ingersoll-Rand 2-stage compressors, operating at 225 r.p.m. and driven by two 500 h.p. synchronous motors. At 100 ft. intervals along the tunnel, through which the air main passes, outlets are provided to recesses in the face of the chamber wall. Water, at city pressure, is also distributed in a similar manner, with all mains and control valves in the wall tunnel.

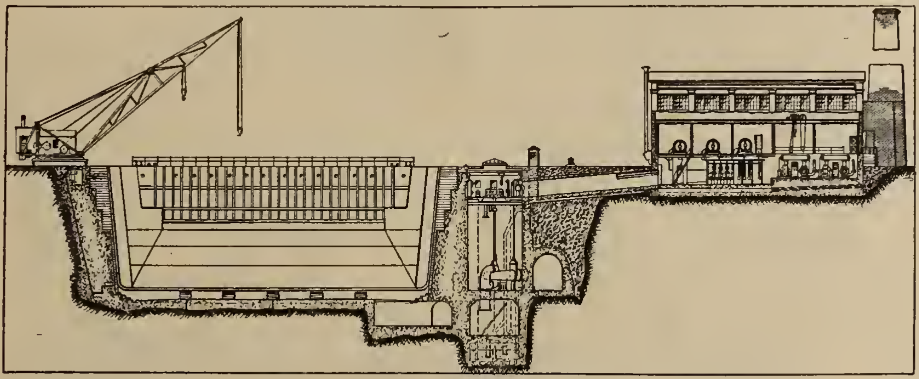
The sewerage system, to care for the wastes from the vessels, consists of a continuous vitrified sewer pipe, incorporated in the base of the dock chamber walls. At 50 ft. intervals, 4-in. outlets extend to the face of the chamber wall, ending there in standard 4-in. brass hose connections to permit the attachment of hose lines from the vessel's side.

Pumping Equipment at St. John Dry Dock

The pumping equipment is, naturally, an important item in dry dock operations and for the St. John dock, the finest machinery for this purpose has been determined upon. The following brief description of the equipment has been supplied by Babcock-Wilcox and Goldie-McCulloch Ltd., Galt, Ont., who furnished the pumps.

The main unwatering pumps consist of three vertical double suction Rees Roturbo patent pressure chamber volute centrifugal pumps, each with a capacity of 2,470,000 imperial gallons per hour against a head of 47 feet, 3,660,000 gallons against a head of 25 feet and 4,200,000 gallons against zero head, or when the water in dock is level with water outside. The three pumps working together are designed to empty the dock with a capacity of 42,000,000 imperial gallons at extreme high tide level in not more than four hours, the depth of water in the dock when pumping starts being 47 feet. Each pump is direct connected to a 750 b.h.p. Westinghouse self-starting vertical synchronous motor, running at a speed of 300 r.p.m., the motor always being started up with a discharge valve closed.

One of the chief features of the pump is the non-overloading characteristic, that is, the variation in power consumption between zero head and maximum head is not more than 10 per cent. of the power taken at maximum head; for instance, power taken at 47 feet head is 734 b.h.p., at 33 feet head 770 b.h.p. and at zero head 660 b.h.p. This is a very desirable feature in a pump dealing wth a variable head condition such as dock unwatering. Each pump has a 48 inch suction and 42 inch discharge.


Cross section through dry dock and associate power plant and pumping equipment

Two 12 in. Rees Roturbo volute pumps, each having a capacity of 2,920 g.p.m. against 69 ft. head, handle the dock drainage. These are of the same type and have the same characteristics as the main pumps and are each driven by a Westinghouse 100 h.p. induction motor with automatic starters and float control switches.

A 4 in. Rees Roturbo volute pump, with a capacity of 400 imp. g.p.m. against 75 ft. head, is supplied for sump service and is driven by a 15 h.p. vertical induction motor with automatic starter and float switch.

Four 12 in. vertical Rees Roturbo pumps are also supplied for emptying the caissons. There are two pumps to each caisson; each pump is driven by 15 h.p. Westinghouse induction motor.

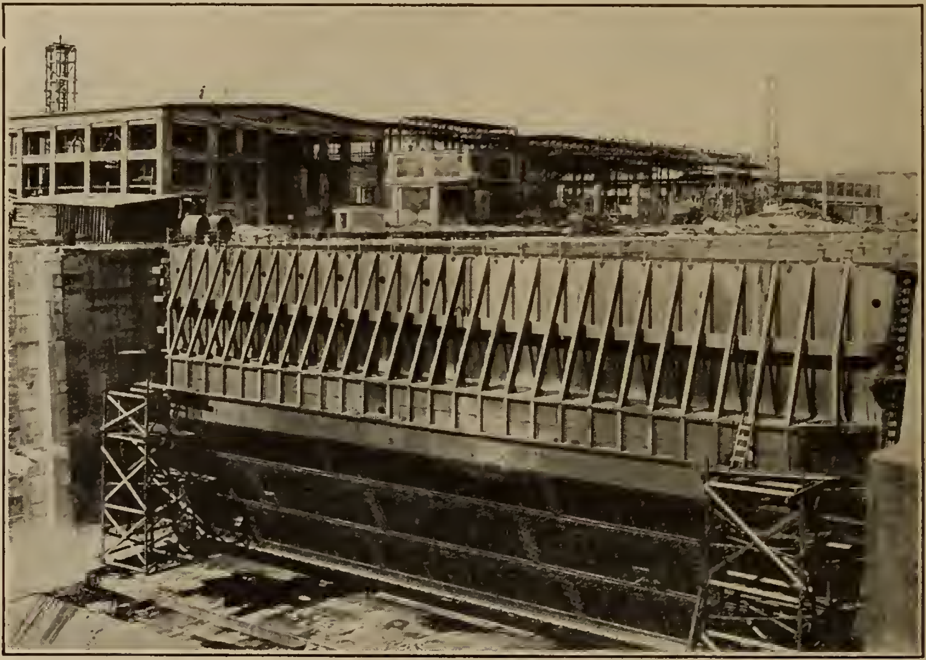
Power for the pumps and repair shops is provided by two 1,100 h.p., non-condensing, De Laval turbines and one 1,100 h.p. Wait, mixed-flow, condensing turbine, each directly connected to 1,100 h.p. Allis-Chalmers 550-volt, 60-cycle, alternating-current generators operating at 3,600 r.p.m. The boiler plant consists of four 500 h.p. Robb water-tube boilers, which are equipped with Hammel oil-burning apparatus.

Construction Plant

Although the Contract Record of January 10, 1923, fully described the methods by which this dock was built, a brief reference to the essential features of the plant will not be out of place here. It is described thus by E. G. Cameron, in a paper recently read before the Engineering Institute of Canada, St. John branch.

This plant consisted of two mixing units, each identical with the other in detail. Each unit consisted of a 1¼-yard Smith mixer mounted on a travelling carriage, having a single aggregate storage bin overhead with a measuring hopper between the storage bin and the mixer. The cement charging platform was located over the mixer and in front of the storage bin and an inclined belt conveyor up one side delivered the bags of cement, placed on it from the cement car door, to the charging platform above. Alongside the mixer car and standing on the same two standard gauge tracks was a travelling clam-shell derrick. This machine filled the storage bin of the mixer from the continuous storage pile of gravel alongside, but in rear of the through track for the cars of cement, directly behind the mixer carriage. These two units both stood on the same pair of standard gauge tracks paralleling the length of the dock and so located that the front of the mixer stood just at the edge of the dock pit. Directly opposite each of these units, standing on a travelling carriage on the dock floor, was an elevating tower. A continuous line of 12-in. concrete chutes extended on a 3 on 1 slope from the receiving hopper in front of the mixer to a similar hopper at the tower base. This connecting chute had inserted in it two line gates, one directly over the wall adjacent to the mixer and the other midway between mixer and tower. To the first gate was connected the chutes leading into the near wall of the dock, and these chutes were suspended from a cable running parallel to the length of the dock. To the other line gate was attached a section of counter weighted chute with swivel head chute extension. Each tower was equipped with a quick shift boom rig which carried the chutes for the north or far wall of the dock.

All parts of this layout being readily moveable allowed of making a continuous storage of gravel for the full length of the dock, along which the plant could move, receiving the concrete materials opposite the point where the mixed concrete could be discharged directly into place in the forms.



Close-up of the outer floating caisson which seals the dock when it is to be pumped out. The caision or gate is equipped with electrically operated unwatering pumps

A concrete mixture of one part cement, two and one-half parts sand with five parts stone was adopted for the concrete of the dock, except in the outer entrance and pumping station divisions, where a one-two-four mix was used for added protection against sea water action. As considerable variation in the grading of the beach gravel was experienced in the stone content, the proper proportion of cement to sand was maintained by daily screen tests and particular attention was given to the matter of keeping down the quantity of water used to a minimum in keeping with good concrete consistency.

The St. John Dry Dock & Shipbuilding Co., which built the dock, is under the management of Mr. F. M. Ross. Mr. E. G. Cameron is chief engineer.

Fireproof Coal Handling Equipment

Old Wooden Construction Being Replaced by Concrete for Canadian Pacific Railway at Montreal

The new coal handling plant erected at Montreal for the Canadian Pacific Railway by the Newton Dakin Construction Company has now been in operation for three months and its subsequent performance has come up to and exceeded the expectations of all concerned.

The plant is of reinforced concrete and is carried on seventeen spread footings, excavation being carried to a point where bearing value of the ground was four tons per square foot. The overall height is 73 ft. 7 inches, and the width is sufficient to allow for the loading of two locomotives simultaneously on two track ways.

The plant will supply both coal and sand. The loaded cars are brought in by a trestle track at the rear and dumped into a track hopper below, drawn off by a steel apron feeder 30 inches wide and delivered to a vertical bucket elevator which rises 65 ft. and discharges the coal at this point to pockets below. The pockets have a capacity of 360 tons and are steel lined with removable plates to take care of any wear that may occur. This equipment can handle a car of coal every 40 minutes.

All floors are open steel grill to prevent the accumulation of coal dust. Kalamein doors and steel sash are used throughout and only wired glass is used in all the windows and doors to ensure resistance against possible breaking.

The power for operating the plant is furnished by electric motor at ground level, transmission being carried to the top of the elevator through a rope drive. The rope drive and elevator are installed in an open well from top to bottom. Access for repairs or inspection is obtained through steel platforms at 12 foot intervals, connected by a steel ladder.

A Fireproof Plant

Owing to the frequency of fire destruction of the wood constructed plants, and their necessary heavy upkeep, the departure into the concrete plant was decided upon by the C. P. R., and this plant is the second one built for that company by the Newton Dakin Construction Company, the other structure being located at Megantic, Que.

To overcome the action of sulphuric acid in the water of melted snow and rain that would seep through the coal if exposed and have destructive effects, a rich mixture of concrete was necessary that would be impervious to all weather conditions. The concrete was therefore mixed in proportion of one part cement, one and one-half parts sand, and three parts of crushed stone. It was found, in pouring the thin vertical slabs, the concrete had to be dropped from considerable height. These slabs were heavily reinforced and with the result that the steel acted as a baffle to the concrete causing a separation of the aggregate, regardless of the amount of water used in mixing. This difficulty was overcome by adopting a 1:1½:3 mix throughout.

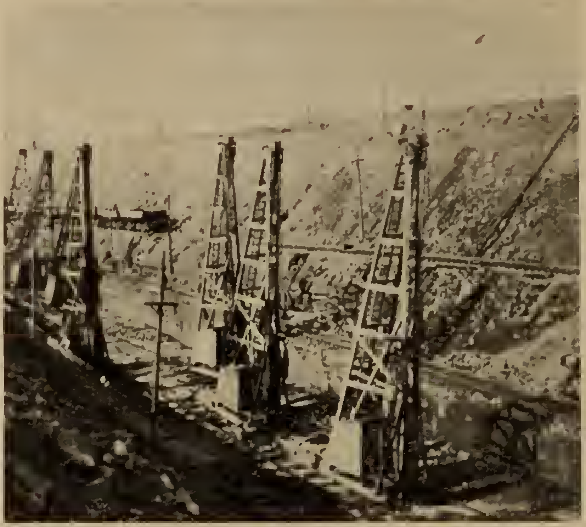
The operating hardware and mechanical installation was of C. P. R. standard design with some improvements made by the mechanical engineers of Messrs. Williams & Wilson, Ltd., who were responsible for the supplying and installation of the machinery.

The cement was supplied by the Canada Cement Co., Ltd.; the metal work and the architectural iron work was done by Faustin, Limited, and Macfarlane Douglas & Company, of Ottawa, supplied and put in the Kalamein doors.

The new concrete coal handling plant of the C.P.R. at Montreal

The Newton Dakin Construction Co., Ltd., were general contractors and designers of the reinforced concrete structure.

The work was supervised by Messrs. J. H. Reeder, divisional engineer and J. E. Beatty, district engineer, both of the Canadian Pacific Railway.



A battery of hollow piston deep hole drills on the Chippawa power canal job. These drills put down 60 ft. holes bottoming at 5 in. They are chiefly used on deep straight wall excavation work.

Developments in the Use of Compressed Air for Contracting and Quarrying

*By G. R. Southee**

The use of compressed air in the contracting field and in the quarry has increased as largely in the past decade as has the number of engineering projects that have been brought to a successful conclusion. In fact, this use of compressed air has increased far in excess of what one would naturally expect, due to the development of hydro-electric power in great abundance, the opening up of vast areas in the development of the pulp and paper industry, the construction of permanent highways and colonization roads, added to the general industrial development.

For example, the recent Chippawa development at Niagara Falls, carried through so successfully by the Hydro-electric Power Commission of Ontario, used approximately twenty thousand cubic feet of free air per minute, and employed upwards of five thousand men. This project, necessitating the use of hundreds of compressed air driven rock drills and pneumatic machines, illustrates the transition from a few pneumatically operated machines to present day equipment.

Compressed Air Replaces Steam

Comparatively few years ago, the average quarry secured ample production by using a few steam operated tripod drills. Holes were drilled on short benches, and block holing was done by sand blasting or mud capping. These methods shortly proved too anticipated to permit of the operators producing their product economically. Large quarries, operating as cited above, in the days of cheap labor and cheap power, could produce their stone and market it at a reasonable price, but with the general advance in the price of labor, and all other commodities, it was necessary to resort to other methods. Working faces were increased and modern compressed air equipment installed. In many quarries where a deep face is now worked, and where electric driven or gasoline driven churn drills, or welldrills are employed for the long deep hole drilling, compressed air plays its all important part in cost production by driving modern heavy hammer drills, that are now employed in drilling toe holes or snake holes, small self-rotating jackhamers for block holing, drill sharpening machines, Little Tugger hoists, cylinder hoists, etc., etc. In other quarries where a short bench of 20 feet or 25 feet is worked, the installation of an air compressor with modern drilling and sharpening equipment has increased the output per drill some 300%.

One of the largest Canadian trap rock quarries has further reduced production cost by employing compressed air. This company has abandoned the churn type of drill and is now quarrying by the tunnel method, using compressed air driven drills of the Leyner-Ingersoll type for driving deep headings, self-rotating plugger drills for block holing, and a drill sharpening machine for the making of shank and forming ot properly gauged drill bits.

The quarrying of brick shale has also profited by the use of compressed air, for the small self-rotated air driven Jackhamer, operated by one man, will in one day's full drilling give as much footage of hole as was obtained in nearly one week from the old steam operated tripod drill, manned by two men.

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*Canadian Ingersoll-Rand Co., Toronto.

The advent of the portable compressed power plant, viz., the gasoline or electric portable compressor unit, has enabled the small quarry operator to derive all the advantages from the use of compressed air, which formerly were only enjoyed by the owner of a permanent installation. Small isolated quarry operations can now efficiently use compressed air drills, sharpening equipment, etc., with the added advantage of portability.

Modern quarrying methods point to the ever increasing use of modern high speed drills of the hammer drill type; the efficiency of these drills is largely dependent upon perfectly formed bits and shanks, which has introduced the air operated steel sharpener. Thus, air plays an important part in all quarrying operations, notwithstanding the changes in method and the equipment which it operates.

Modern quarrying methods are distinguished by the ever increasing use of large hammer drills for heavy work and Jackhamers for light drilling

For Contracting Operations

The most notable advance in the use of compressed air has been in the contracting field. Only a few years ago in isolated cases a steam driven compressor was used by some adventurous contractor, whereas today, practically every town and city has portable compressors operating on its streets. The field ranges from large hydro-electric developments to the small sewer contract. Modern large contracts involving millions of dollars demand the same efficiency from air equipment as a modern industrial plant. As a recent example on one of the very large contracts on which operations are about to commence two 2,000 cubic foot direct-connected electric-driven air compressors are being used, each driven by a synchronous motor. These will furnish air for modern rock drills, steel sharpening equipment, pumps, pneumatic tools, and other pneumatically operated apparatus. It is not so long ago that steam drills, or drills operated by compressed air produced by steam generated by wood-fired boilers, would have been employed on a contract of this kind. Thus, while compressed air has long been recognized as most valuable on a large construction job, its scope has become so wide that future large construction work will necessitate the use of so much compressed air that the contractor will be compelled to demand the utmost efficiency from his air equipment.

Jackhamers cutting marble. For granite and other hard rocks heavier drills are used

Usefulness of Compressed Air Has Increased

A new field, however, is the small contract. The advent of the portable gasoline-driven air compressor unit has made it possible to operate many labor saving devices, which previously could not be employed on a small contract, owing to the cost of setting up, tearing down, or moving a permanent compressor plant from place to place. At the present time, no matter how

Pneumatic clay diggers with suitable pick points are widely used for demolishing buildings. Pneumatic chisels are employed for cleaning the salvaged brick

Pneumatic hoists of the type illustrated are widely used for hoisting brick, concrete and steel, hauling cars, excavating and backfilling with drag scrapers

Pneumatic paving breakers and clay diggers cut the cost of excavation in clay, frozen ground, hardpan, etc.

isolated the contract, these new gasoline-driven compressor units permit a supply of compressed air being available at any given point.

One of the most notable examples in the use of compressed air in speeding up work on small contracts is its application to sewer work. This type of work is now being revolutionized by the invention of the pneumatic clay digger. In many cities storm sewers are being constructed by tunnelling through clay underneath the city streets. Recent performances have demonstrated that the pneumatically operated clay diggers have increased production from 90% to 150% per man, over the old fashioned hand pick. The same thing is true of open cut excavation. This little machine when fitted with extension handle in the hands of an experienced operator will loosen enough ground to keep five or six hand shovellers busily engaged. Should hard rock be encountered the contractor has a supply of compressed air at hand to operate the ever-ready drill.

A further wonderful labor-saving device made possible by the development of the portable compressor is the pneumatic concrete breaker, which is proving indispensable to the city, its contractors, and public utility corporations. Work, such as repairs to concrete or asphalt, manhole excavation, rehabilitation of street railway system, opening up of gas services, can be accomplished now-a-days in one half the time formerly taken.

Bridge repair, steel erection, steel transmission power erection and maintenance come within the scope of the contractor having portable compressed air equipment. The cutting out of old rivets, replacing rivets, cleaning scale, painting or sand-blasting, no longer cause any worry. Compressed air drives riveting hammers, sandblasts, pneumatic wire brushes and paint sprays.

The application of compressed air on large contracts, due to the ever increasing number of large scale operations in Canada, and on small contracts, owing to the development of the portable compressor, pneumatic spades, concrete breakers, etc., etc., has become so general that compressors and compressed air equipment are now an essential part of every up-to-date contractor's plant.

Few road, street and foundation excavation jobs are now undertaken in the metropolitan districts without the use of air-operated paving breakers

Drills of the Jackhamer type can be used close to a wall or foundation and are widely employed for this class of work. They can be operated wherever the runner can gain a foothold

Progress in the Manufacture of Rail-Steel for Concrete Reinforcement

*By J. B. Carswell, B.Sc., A.M.I.C.E., A.M.E.I.C.**

The Farmers' Dairy building, Toronto; Harkness, Louden and Hertzberg, engineers; Jackson-Lewis Co., general contractors. Rail steel reinforcement was used in this building

It was a great day in the march of science, but a day little known and little noted, when in the year 1820 John Berkinshaw of Belington, England, rolled the first practical rail. Since that day engineering achievements have progressed smoothly, steadily, and with ever increasing speed, until today, one can hardly keep abreast of the times,—civilization has gone forward on these strong rugged arteries of steel which today cover the universe in a network of communication and make our rushing 20th century existence possible.

And now we have come to an age of economic pressure, an age of keenest commercial competition, an age when engineering ingenuity is keyed up to its highest pitch, when economic waste cannot be tolerated, when the word "by-product" may spell the difference between success and failure. And in this atmosphere some twenty years ago was born a new industry—the manufacture of commercial steel bars and shapes from disused rails.

Railroad companies, to meet modern demands, had steadily been increasing the size and weight of rolling stock, and had just as steadily been increasing the speed of their service. This in turn necessitated heavier rails and more frequent renewals and consequently a great tonnage of used rail was being constantly thrown on the market.

The economic waste in melting down this steel was soon recognized for the only defect in the rail when it leaves the roadbed is surface-wear. The steel in the rail otherwise is of the purest grade manufactured under most careful inspection to satisfy the rigid requirements of rail specifications. It was further recognized that the high elastic limit of the steel made it eminently suitable for use in reinforced concrete and in many other special fields.

A process was soon evolved whereby these rails were heated and rolled down without changing or destroying the quality of the steel, and this process with many minor improvements is in use today.

The rail after being heated to about 2,000 deg. F. is passed through a slitter-roll which separates the head, web, and flange. These three sections are then passed through three separate sets of rolls and the rail head generally speaking is rolled into bars for reinforcement, the web into small angles and tees, and the flange into special shapes for agricultural implements or bedstead work. Brake-beams for railroad cars are also manufactured extensively.

There are in the United States eleven mills engaged in this business and in Canada one large mill in Hamilton. During the past year these mills have rolled down approximately half a million tons of rails into reinforcing bars and other miscellaneous shapes, and about one-half of this tonnage went into reinforcing bars alone.

Looking at this from a national economic standpoint, the total labor involved in manufacturing half a million tons of fine grade steel, and part of the labor involved in rolling this steel into rails, was saved to the country by the existence of this group of steel mills.

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*Consulting Engineer, Rail Steel Products Association.

When the industry first started, some doubts appeared to have been held amongst certain engineers that the bars produced could not be depended on because of the lack of exact knowledge as to their origin.

But today practically every rail reaching a rail-steel mill is no older than 20 years, the average age being 17 years, and every engineer knows that railroad rails rolled any time since 1900 must of necessity contain only the purest of hard-grade steel otherwise they would never find their way into a modern road-bed, and from there to the rail mill.

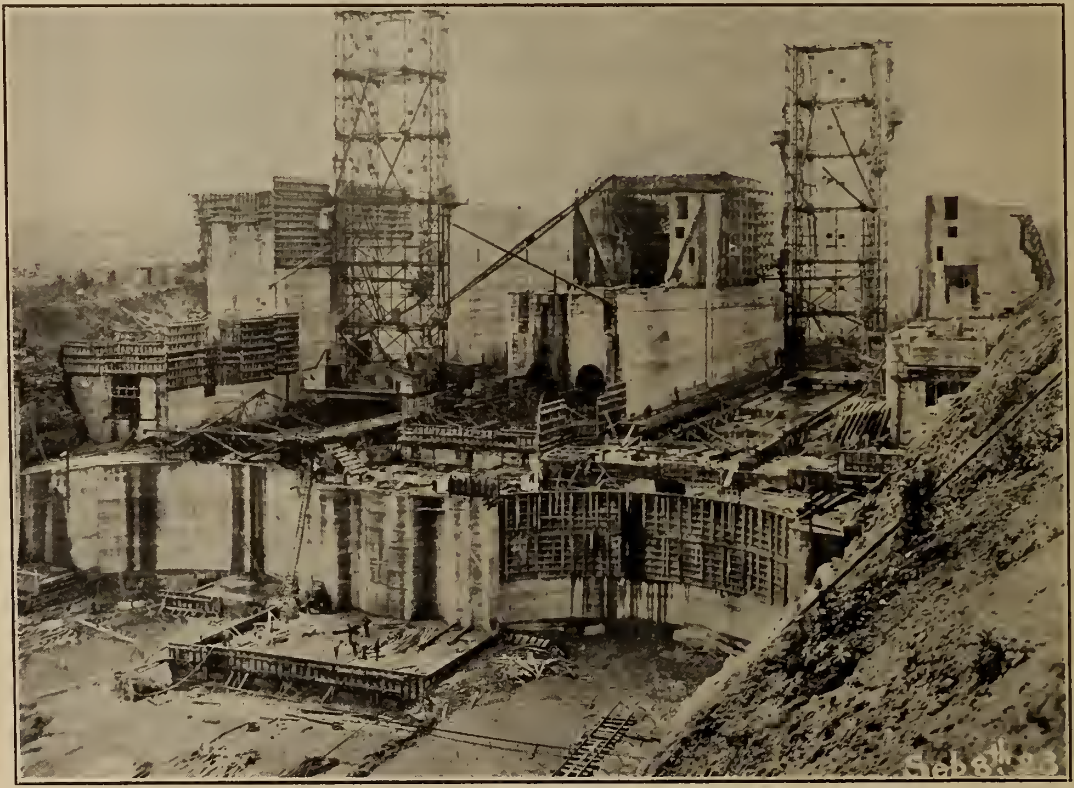
Laboratory tests carried out from day to day in the business routine of these mills show the product extremely uniform. The elastic-limit of these bars varies between 55,000 and 65,000 lbs. per sq. inch which gives a very strong bar indeed when embodied in a modern reinforced concrete structure.

In the year 1914, the American Society for Testing Materials issued the standard specification A-16-14 which today practically controls the entire output of rail-steel bars in the United States. Here in Canada, the Canadian Engineering Standards Association this year issued their new specification A9-1923 practically identical in detail with the A.S.T.M. specification.

The industry has therefore been accepted officially by the engineering communities boht in the United States and in Canada and any little prejudice there may have been in the past against this material today has been practically swept away.

In this connection it is interesting to note that at the present moment rail-steel is being shipped out of Franklin, Pa., to the United States government at Florence, Alabama, for the Muscle Shoals work, and at the same time in Canada rail-steel is being shipped from Hamilton, Ont., to the Canadian government at the Welland Canal.

Both governments have evidently recognized the economic advantages of this material in its greater strength and purity. These are without doubt the two most important engineering works going on in their respective countries in 1923.



Lock No. 6 of the Welland Ship canal, Peter Lyall and Sons Construction Co., general contractors. Rail steel reinforcement was used in the work

During the past year many important structures in and around Quebec and Ontario have been built with rail-steel bars, several of which are shown here. It is interesting to note how buildings requiring great strength such as grain elevators, storage warehouses and factory buildings with heavy floor loads gravitate to rail-steel almost exclusively.

In the Hamilton works during the past year a complete new mill, embodying the very latest improvements, was installed, practically doubling the capacity of the plant and all summer the mill rolled steadily to supply the ever increasing demand for this material.

The Developments of the Past Year in Concrete Road Construction

Bates Experimental Highway Yielded Results of Outstanding Importance—Fundamental Principles Now Well Established

By H. COLIN CAMPBELL
Portland Cement Association

On November 1st of 1923, 73,965,000 square yards of concrete pavements had been completed in Canada and the United States. In round numbers, 36 million square yards were carried over from 1922 and 68½ million square yards were contracted for during the year making 31,000,000 square yards to be carried over for completion in 1924. The equivalent of 2,300 miles of 18-foot pavement was laid in 1919; 3,500 miles in 1920; 6,000 miles in 1921; 6,300 miles in 1922 and over 7,000 miles in the first 10 months of 1923.

With the immense yardage that is being laid, the practical experience that is being acquired in actual construction, and the study and observation of engineers, you quite naturally ask what is the trend of road building practice.

Experimental Road Was Important Development

The outstanding development of the year was the results obtained from tests made on the Bates experimental road. It was conceived and constructed by the Division of Highways of the State of Illinois to furnish reliable information to be used in designing the pavement for 5,000 miles of state highways. The test road consisted of sixty-three sections of pavements each 18 feet wide and from 100 to 250 feet in length, laid end to end so that they made a continuous straight pavement two miles long.

Twenty-two of these sections were of brick, seventeen of asphalt and twenty-four of concrete. In each type of pavement the sections varied from those so thin they were sure to break under the lighter test loads to sections which were considered strong enough to support successfully the heaviest loads permitted by the state traffic laws. All the materials for the pavements conformed to the very high standards required by the state specifications. The spirit of the whole test was: "learn the facts."

Over this pavement a fleet of army trucks made 23,200 round trips. Beginning with the bare chassis, loads were increased in 2,000 pound increments until a gross load of 10 tons was reached. The greatest traffic imposed upon any section was 377,460 tons, of which 52.6 per cent. was the state's legal load limit of four tons per rear wheel. A summary of the test traffic is given in the table below.

General Results of the Test

Although a thorough study of the results of the traffic runs has not yet been made, the following general comparison seemed justifiable to chief highway engineer, Clifford Older:

> "A difference in the thickness of the base, thickness of the brick or type of brick apparently had no effect upon the load supporting capacity of these sections. All five sections failed at approximately the same time and to the same extent."
>
> "No consistent ratio of strength to thickness of base appears. Apparently traffic supporting capacity increases with an increase in thickness of asphaltic top. The evidence supporting this point is not conclusive, however."
>
> "The assumption made at the beginning of construction that an asphaltic concrete wearing surface on a concrete base would have a traffic supporting capacity, equal to that of a concrete pavement having a thickness equal to that of the base plus one inch, seems to have been a fair guess. It is further evident that increased base thickness is accompanied by increased strength."
>
> "The original assumption that a bituminous-filled brick wearing surface on a concrete base has a strength equal to that of a concrete slab having a thickness equivalent to that of the base plus one-half the thickness of the brick surface was apparently incorrect. In practically every instance the concrete pavement sections proved of greater strength than their supposed equivalent in bituminous-filled brick."

Brick and Concrete Not a Unit

> "The original assumption that the brick surface in this type of pavement acts as a unit with the concrete of the base, thus forming a truly monolithic slab having the same carrying capacity as an equal thickness of concrete, was disproved early in the traffic tests. It was clearly evident that the strength of a so-called monolithic section was less than that of a concrete section of the same thickness."
>
> "In comparing an added inch of brick with an

SUMMARY OF TRAFFIC

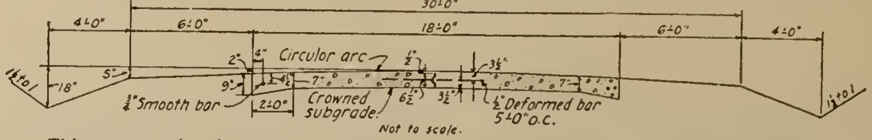
Increment	Load in pounds on each rear wheel	Load in pounds on each front wheel	Gross load	Net carried or live load in pounds	Number of round trips Day	Night
First	2,500	2,250	9,500	....	1,000	....
Second	3,500	2,150	11,300	....	2,167	1,033
Third	4,500	2,000	13,000	1,700	2,000	1,000
Fourth	5,500	1,900	14,800	3,500	2,000	1,000
Fifth	6,500	1,800	16,600	5,300	2,000	1,000
Sixth	8,000	1,930	19,860	8,560	5,000	5,000

added inch of concrete base, the total thickness remaining the same, it was noticed that the thicker base section has the advantages."

"Soon after starting traffic it developed that the sections containing special cements or other chemicals showed less strength than plain concrete sections of the same thickness."

"Sections containing certain special features of design consisting of tranverse and longitudinal joints with marginal steel, showed greater strength than plain concrete sections of the same thicknesses."

The table summarizing the results of the traffic test shows that two asphalt, one brick and ten concrete sections carried the entire test traffic without a decisive failure. All the concrete in these thirteen successful sections, whether in a concrete base or concrete pavement was proportioned 1:2:3½.



Not to scale.

This cross-section for concrete roads is one of those adopted by the Illinois Division of Highways as a result of the traffic tests on the Bates experimental road. Thickened edges and centre joints are also specified for concrete base under asphalt tops. The centre joint with uniform base thickness is specified for brick pavment

This overwhelming victory for concrete pavements is better realized when expressed as a percentage: 4½ per cent. of the brick, 11¾ per cent. of the asphalt and 41-2/3 per cent. of the concrete sections satisfactorily sustained the entire test traffic. Additional tests over new sections built to the design which was determined on by the first tests were made during the summer of 1923, but final results have not yet been announced by the Illinois Division of Highways.

Principles of Construction Generally Well Understood

The construction of concrete roads is greatly influenced by the fact that the concrete pavement has been developed by many engineers working independently in all parts of the country. The fact that suitable materials for concrete pavements are available practically everywhere and the further fact that there has been no proprietory process on machinery required for the production of concrete pavements has facilitated the independent thought of many engineers in taking care of the pavement requirements of their own communities. While the fundamental principles of concrete pavement design are the same for all parts of the country, there are wide divergencies in the details of construction, design and the materials used. In the early stages of concrete pavement construction, perhaps prior to the year 1914, it was thought by many engineers that a mixture based on current pavement foundation practice was sufficient for a concrete road having no protective or wearing surface. A form of concrete pavement known as "Dolarway" was developed which consisted of a comparatively lean mixture of concrete with a thin wearing surface of bitumen and sand or rock screenings. It is possible that a pavement of this character might have proved successful had the nature of traffic on our streets and highways remained the same as it was about the year 1910. However, a rapid increase due to the improvements in the motor vehicle and the consequent lowering of its cost brought about a change in the requirements for a successful pavement. It was soon found that the lean concrete mixtures did not have the strength to support heavy motor trucks. It was also soon observed that those engineers who had been utilizing rich mixtures for their concrete pavements, together with clean and sound materials and good mixing methods, obtained pavements which were giving excellent service even under very heavy traffic. Highway engineers generally were prompt to profit by their experience and, as a consequence, the fundamental principles of successful concrete pavements are now well established and thoroughly understood.

Extensive laboratory investigations have de-

General view of the Bates road from the observation tower at the east end

Section 40, Bates road, in the foreground looking towards sections 41, 42, 43. These concrete sections carried all the traffic without failing

finitely established the fact that the amount of water used in mixing concrete is a function of the strength of the resulting concrete. This principle has had a most important bearing on the methods of construction used in the field, as well as upon design and specifications. As a result of this discovery, it is determined that the high strength of a concrete made with aggregates so graded as to have a minimum of voids or maximum density is due to the fact that less mixing water is required to produce a workable concrete under these conditions than when aggregates are employed which have a harsh or uneven grading. It was formerly believed that maximum strength concrete was produced by the aggregate having maximum density and the strength was due to the grading of the materials and to nothing else with the exception of the cement content. It is now understood that the ratio of volume of mixing water to the volume of cement in a batch of concrete is a fairly definite function of the strength of the resulting concrete.

It has been found that careful preparation of the materials for pavement concrete is economical because of the exceptional stresses, both structural and abrasive, to which the slab is subjected. An aggregate containing an excessive amount of fine material is apt to produce a slab subject to surface scaling which is detrimental and unsightly. On this account it is worth the additional expense to have aggregates washed or so prepared as to eliminate any undue amount of fine material, whether this material be in the form of clay, loam, stonedust, or any material of a fineness capable of passing the 100-mesh sieve.

It has also been learned that organic impurities in sands for concrete may have a very serious effect on the strength of the resulting concrete. Organic impurities are most conveniently removed from sands by washing and this furnishes another economic reason for using only thoroughly washed materials.

Reinforcement for Concrete Pavements

The subject of reinforcement for concrete pavement is one upon which there are many divergent ideas. About the most that can be said on the subject at this time is that reinforcement is of value in preventing such cracks as may occur in a pavement from opening up and becoming unsightly. It appears to be impractical to use a sufficient amount of reinforcement to prevent entirely cracking from any cause. The use of reinforcement, however, does tend to prevent cracking and it is believed that there will be found soon a rational basis for proportioning and placing reinforcements in pavements in accordance with the nature of the subgrade under the pavement and the demands of traffic.

The study of a summary of the essential points of the specifications for concrete pavements from various parts of the country reveals many apparently contradictory practices which an engineer may at first be at some loss to understand. For example in one state it is stipulated that pavement shall be built with expansion joints at intervals of 30 feet. Another state may require that the expansion joints shall be spaced 50 feet apart. Another may require that such joints shall be built anywhere from 100 to 200 feet apart, while still another does not require their use at all. The answer to this seemingly contradictory practice is found in the practical experience of each community. As a general proposition, however, at this time it may be said that the tendency is toward the elimination of joints in highway pavements. This tendency is not so marked or is altogether absent in the design of pavement for city streets. Many are still generally of the opinion that expansion and contraction joints must be provided for street pavements.

Local Conditions Govern Specifications

Another idea of apparently contradictory practice is found in specifications for materials. In one state it is observed that the specifications provide for the use of washed and screened pebbles taken from natural deposits of gravel. Another state prohibits the use of pebbles altogether requiring that nothing but crushed rock may be used. Here again the answer is found in the local conditions. Certain parts of the country have abundant deposits of pebbles composed of sound and enduring material and which when properly prepared produce excellent concrete. If the preparation of materials from such deposits is much cheaper than materials secured from any other source and produces results entirely satisfactory, it is the natural economical thing to utilize such material. These conditions, however, do not exist in other sections where ledge rock is the only natural material satisfactory for concrete pavements. These facts account for the seemingly contradictory statements by engineers that pebbles may or may not be satisfactory for use in concrete pavements.

The surface finish of concrete pavement is now recognized as of first importance among the construction details. Early methods, crudely applied, resulted in uneven joints and surface. At first, under the comparatively slow traffic, this important surface was not considered a serious defect, but as motor vehicles increased in weight and in speed of travel, more and more pains were taken to produce a perfect riding pavement. The development of the roller and belt method of finishing, and later the machine finish followed by longitudinal floating, produced a regular, even surface not possible of attainment in any other type of pavement.

Halifax Elevator Held Up

The government has indefinitely postponed the erection of the proposed grain elevator at Halifax. Tenders submitted on the recent call were all found to be too high.

Scene between Beachville and Woodstock on the completed Woodstock-Ingersoll provincial highway

An Excellent Stretch of Concrete Road

The 7-Mile Provincial Highway Between Woodstock and Ingersoll, Ont., Completed in Four Months—Details of the Construction Procedure

One of the most important contracts awarded this year by the Ontario Department of Public Highways in connection with the provincial highway scheme, was for the construction of a concrete road between the city of Woodstock and the town of Ingersoll. This road, connecting two of the oldest and busiest municipalities of the province, forms an important link in the highway between Hamilton and London and the contract for its construction was one of the largest awarded during the year by the provincial government. For this reason, it has been selected as one of the typical road construction jobs to be described in this "Construction Review" number of "The Contract Record." The highway was officially opened a few weeks ago with ceremony and is now carrying heavy through and local traffic.

The Woodstock-Ingersoll highway is 37,800 ft., or a little over seven miles, in length. The width of the pavement is 20 ft. and the average thickness 7½ in., the crown being 2½ in. One course concrete of 1:1½:3 mix was specified. Considerable speed was made in handling the job, only four months being required for the completion of the contract. That such a record was attained on a contract of the magnitude of this was due largely to the splendid organization of the contractor, Mr. Paul Bergmann, of Waterloo, Ont.

Handling of Materials

Stone and cement were supplied to the contractor by the Department of Public Highways, being shipped to Beachville, about midway between Woodstock and Ingersoll, at which point a special siding was built for the convenience of this contract. The stone was lifted from the cars into large bins by means of a mechanical loader and conveyor, while the cement was unloaded from the cars directly into 3-ton trucks and hauled to the mixer only as required. The average haul was two miles. Sand was obtained by the contractor from various pits and loaded on trucks with a conveyor.

The stone was spouted from the supply bins into 5-ton trucks and hauled to the site of the work, being deposited there in long piles along one side of the road. The piles were about 150 ft. long, 12 ft. wide and 4 ft. high, while the sand piles, which alternated with the stone piles, were about half the length. Space was provided at the end of piles for turning the trucks. All piles were at least 125 ft. from the mixer as the work progressed.

Woodstock-Ingersoll provincial highway under construction

On account of the expense of covering material, only enough cement was hauled from the siding to the site of the work as was required for the work in hand at the time. On no occasion was the supply more than a few hours in advance of mixer requirements. However, inasmuch as 1,850 bags or about 27 truck loads were frequently used in one day, there was small chance for an accumulation of cement on the ground.

The concrete aggregates were hauled from the roadside piles to the mixer in horse-drawn dump carts. The carts were first loaded up to a predetermined mark with sand, by five men with shovels. Stone was then dumped in by means of a Barber-Greene loader, which was one of the most important pieces of equipment on the job. This machine, equipped with crawler type traction, has as its distinguishing feature a pair of rotary disc self-feeders, which dig their own path into the pile, enabling the continuous bucket elevator to make quick work of raising the stone and cleaning up the piles. A hopper with cable operated chute enabled the carts to be filled quickly with the desired volume of stone. After receiving their loads, the carts were dumped into the side loader of the paving mixer, when the proper proportion of cement was added. At least 50 seconds were allowed for the mixing of the batch.

The water for the mixer and for other road operations was pumped for a short distance by means of a pump of 30 gals. per minute capacity under a head of 120 ft. The pump pressure was 400 lbs., while that at the mixer was 50 lbs.

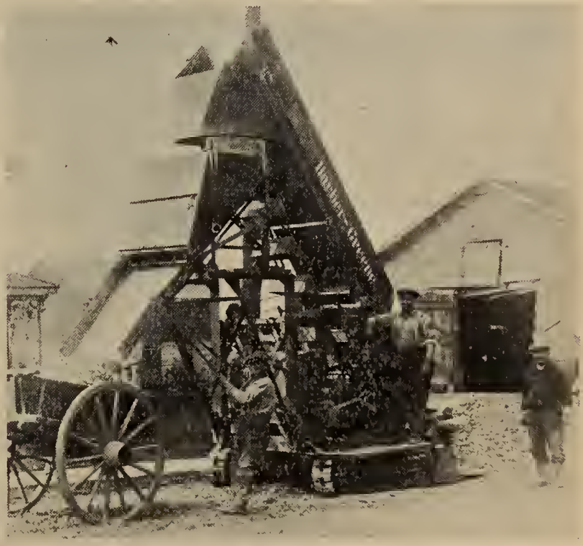
The Paving Procedure

The mixer was of the paving type, equipped with a horizontal boom and bucket, which enabled the concrete to be deposited where required. Four shovellers spread the concrete while two tampers shaped it with templates. They were followed by two finishers, who belted the surface and turned the edges as the final operation.

While the concrete was being poured, the roadway ahead of the mixer was brought to grade by means of a road scraper, road roller and scarifier. Just before the actual paving operations, the subgrade directly in front of the mixer was trued up and side forms were set and lined up true as to alignment and grade.

On the day after pouring, the concrete was covered with a layer of dirt about 2 in. thick, which was watered each night for a period of ten days. After curing for 21 days, the pavement was cleaned and opened for traffic.

The quantities involved in the construction of this road were: 126,000 bags of cement, 18,900 tons of stone and 9,450 tons of sand. The hauling of this material was done by six trucks operating over a period of four months. With the 15 cu. ft. mixer, as much as 3,070 lineal ft. of pavement was completed in one week, and 550 lineal ft. or 1,222 sq. yds. in one day.


A Barber-Greene loader helped to speed up operations

The contract was handled by Mr. Paul Bergmann, of Waterloo, the field engineer in charge being Mr. S. A. Purvis, B. Sc.

The illustration in Figs. 1 and 2 are reproduced by courtesy of the Canada Cement Co.

Addition to Simpson Store Was Unusual Construction Job

The Necessity of Keeping Boiler Room and Delivery Lane in Operation Complicated the Foundation Work—Special Column Treatment to Tie in with Old Building

The site for the recently completed addition to the store of The Robert Simpson Company Limited, Toronto, was formerly the lane connecting Queen and Richmond streets almost directly south of James street. This eight-story building, which adds some eighty-seven thousand square feet of floor space to the store extends two full bays west from the old building for the full length of the old lane.

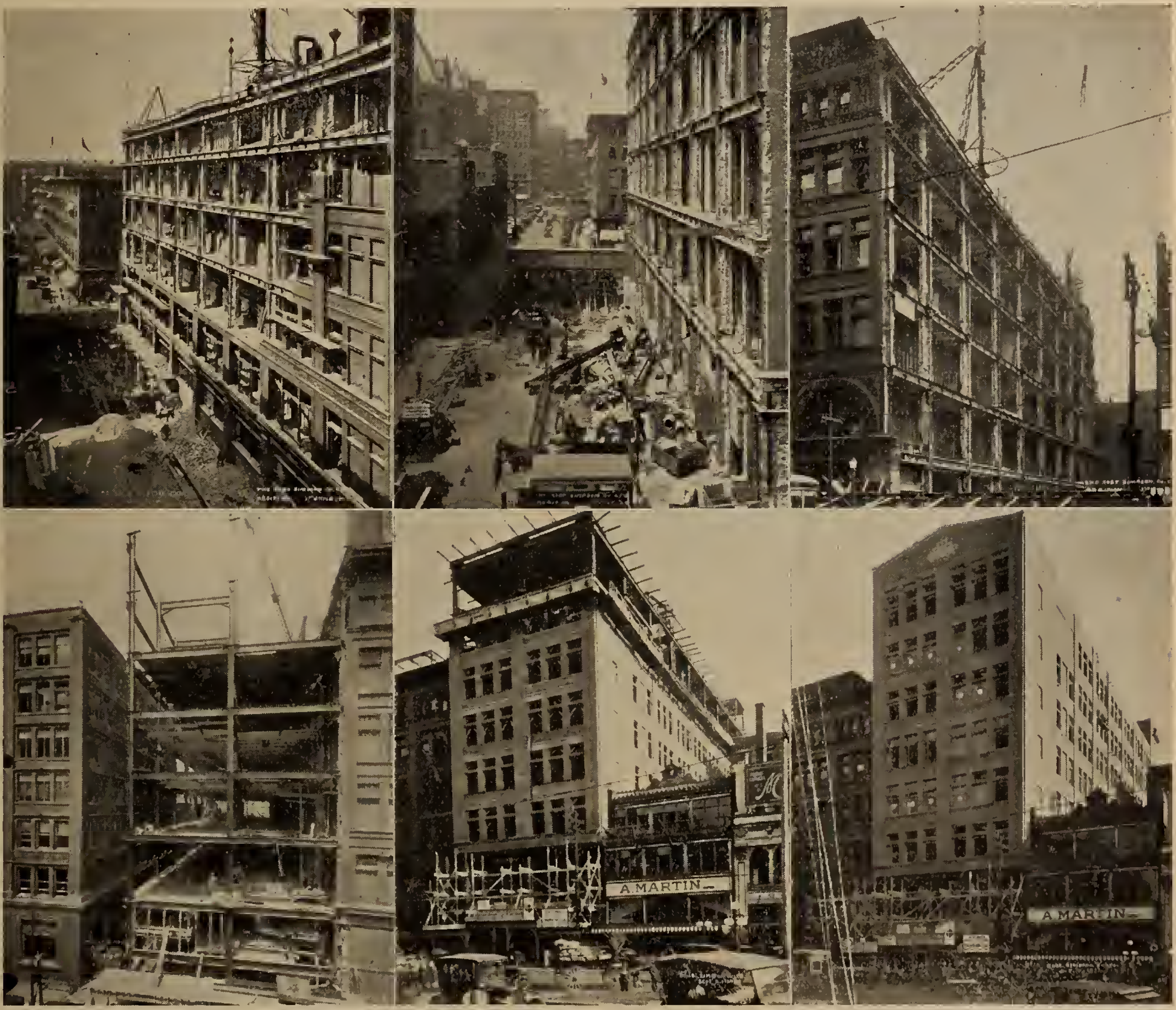
The new addition to the store of the Robert Simpson Co., Toronto

The new addition is of structural steel construction with reinforced concrete floor slabs. The steel columns, beams and girders are finished with hollow tile and the exterior walls are of pressed brick backed up with interlocking tile. The brickwork on the Queen and Richmond street elevations of the old building is ornamented with architectural terra cotta and the window sills and transoms are of Portage Entry stone. As the short time allowed for the erection of the building would not admit of the use of either of these materials in the new addition, they have been very effectively reproduced in Benedict stone.

In order to provide unobstructed sales space in the store the entire west wall of the old building was removed from the roof to grade. Temporary hoardings from floor to ceiling were erected on each floor about three feet inside the old wall so that business was interrupted as little as possible during the work. Figures 1 and 2 show different stages in the wrecking of this wall. This operation was successfully carried out without accident in twenty-seven days.

Speedy Erection Required

Work was commenced on April 28th, and in order to have the sales space ready for the store's Christmas business a very speedy erection schedule was called for. The accompanying photographs, showing different stages of construction, will indicate the progress that was made. On September 25th, a portion of the second floor was opened and, after this, as each floor was completed, it was turned over for occupancy until November 20th, when the entire sales space was in use.



A series of progress views of the construction of the store addition of the Robt. Simpson Co. From left to right they are as follows: Fig. 1 (June 1)—West wall of old building removed and excavation proceeding. Fig. 2 (July 3)—Same operations further advanced. Fig. 3 (July 3)—Erection derricks on top of old building. Fig. 4 (Aug. 3)—Steel frame viewed from Richmond St. Fig. 5 (Sept. 6)—Status of the brickwork a month later. Fig. 6 (Oct. 8)—The building entirely closed in.

Previous to the erection of the new building the lane had been used by the delivery and receiving departments of the store. These departments were eventually moved to a new location in the basement of the old building on Richmond street. During the early stages of construction, however, they had to be maintained in uninterrupted operation from the lane, which caused some congestion. At this time the lane was also being used by the excavators and wreckers for the removal of their materials, and considering the cramped conditions very good progress was made on these portions of the work. Locating the receiving and delivery departments in the basement on Richmond street, necessitated the installation of a new dispatch hoist. This elevator, which travels only from the street level to the basement, is of sufficient capacity to allow the store's largest delivery trucks to be driven on it and lowered to the basement for loading. The completion of the dispatch hoist turned the lane over to the contractors entirely and greatly relieved the congestion.

Boiler Room Added Complications

During the time that the west wall of the existing building was being removed the general excavation was taken out. Figure 2 shows the extent of this work. Only the northerly half of the lane and the portion under the sidewalk to the curb on Queen street were required to be excavated. This area was taken down to the level of the existing basement floor.

The southerly half of the lane is occupied by the store's boiler and machine rooms, consisting of a basement and sub-basement and extending some forty feet below the level of the old lane. The construction of the foundation in this portion afforded the most interesting problem in the erection of the new building. These foundations had to be installed without interrupting the operation of the mechanical and electrical equipment of the store, practically all of which is located in this basement and sub-basement. The southerly half of the lane was carried on the structural steel and reinforced concrete roof of the boiler room, all of which was required to be removed as well as the four centre columns supporting it. In order to protect the equipment the roof of the boiler room was left on as long as possible. Shoring to carry the lane was installed around each of the four centre columns and carried down to the floor of the sub-basement. These columns were then burned off about three feet above the floor and the cast iron bases were removed. After the existing concrete footings had been cut away the enlarged new footings were poured and the new bases set. Holes were cut in the roof and basement floor slabs, and the steel framing into the columns was bared so that all connections could be burned off.

In the meantime, the steel erection derricks had been located on the roof of the old building, and these were used to pull the old columns up through the holes in the slabs. The new columns were also set through these holes. Before the roof slab was removed the steel for a new mezzanine floor in the basement was set.

The exterior retaining walls of the boiler room are of brick in cement mortar and the west wall was used for the foundations of this row of columns. The old brickwork was cut away and toothed out to form seats for the new concrete foundations at these points.

Special Column Treatment

New columns were provided on the west face of the existing columns in the west wall of the old building. The foundations for each of these columns in the boiler room section received a different treatment in order to escape the existing equipment. The installation of these footings and the setting of the structural steel work in this section was a tedious operation on account of the lack of working space and the temperature of the boiler room.

The concrete footings for the existing columns in the northerly portion of the old west wall were not carried down to rock. The new columns on the west face of these old columns were carried on steel grillages resting on concrete foundations extending to rock on either side of the old footings. Only two caissons for the new footings were dug below the old footings at a time and these at different columns so as to prevent any settlement of the wall. The new footings were carried in under the old ones on either side forming a shoulder to support the old foundations. The center row of columns for this section are carried on concrete piers to rock. These were dug as open caissons. The foundations of the Martin Building, immediately adjoining the site on the west side, are not carried down as deep as the elevator pits of the new building located along this wall. The east wall of this building was underpinned before the caissons for the new columns on this row were dug.

In addition to the added sales space the new building provides the store with two new stairways, one freight elevator and one passenger elevator. Four new passenger elevators have been added in the old building on the Queen street side and close to the new section. Additional toilet accommodation is provided on each floor, and on the third floor a large new women's waiting and rest room is included. The sixth floor of the new building has been given over entirely to extensions to the present dining room and kitchens. A portion of the seventh floor will be occupied by the executive officers of the company.

The architects for this building were Horwood and White, who also designed the original store.

The following contractors were employed:—General contractor—The Jackson-Lewis Co. Ltd.; plumbing and heating—Purdy-Mansell, Ltd.; electric work—Canadian Comstock Co. Ltd.; structural steel—McGregor & McIntyre, Ltd.; excavation—Ontario Foundation and Engineering Co. Ltd.; wrecking—Ontario Wrecking & Construction Co. Ltd.; ornamental iron—Dominion Bronze & Iron Ltd.; glass—Consolidated Plate Glass Co. Ltd.; stone—Canadian Benedict Stone Co. Ltd.; kalamein doors—Fireproof Door Co. Ltd.; revolving doors—R. A. Sproule & Son; marble and tile—Italian Mosaic & Marble Co. Ltd.; plastering—R. C. Davey; millwork—R. Laidlaw Lumber Co. Ltd.; hardware—Canada Hardware, Ltd.; painting—Joseph McCausland & Son, Ltd.; roofing and sheet metal—W. H. Moffatt Company; elevators—Otis Fensom-Elevator Co. Ltd.

Mr. S. W. Jenckes, president of the Engineering & Machine Works of Canada, Ltd., died recently at St. Petersburg, Florida, where he had gone to spend the winter.

The Insurance Exchange Building

A New Office Structure in the Heart of Montreal—A Description of Its Important Features

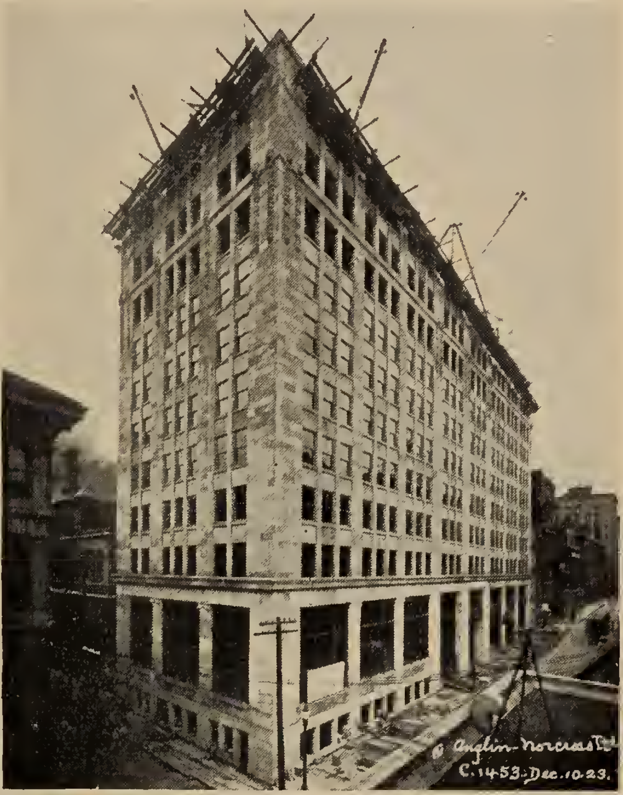
Designed by a Canadian architect and built by Canadian contractors, the new Insurance Exchange Building, Montreal, will take a high place among Canada's finest achievements in office structures.

Located in the heart of Montreal's financial district the building occupies the greater portion of the block between St. John and St. Peter streets on the south side of St. James street, extending through to Notre Dame street and along that thoroughfare to St. Peter street, thence north on St. Peter street to the Molson's Bank. The property frontage on St. James street is 96 feet 7 inches, 184 feet on Notre Dame street, and 65 feet on St. Peter street.

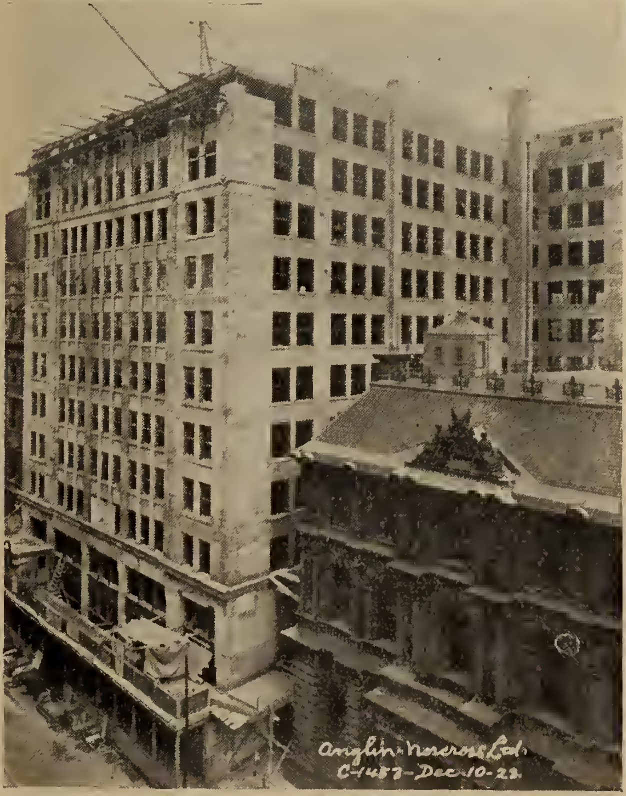
The construction of the building is of the latest type, all street elevations being built of Indiana limestone. The frame of the building is of structural steel incased in concrete for fire protection.

To clear the site for the new structure a large five storey building had to be torn down and this was done in record time of thirty days by J. A. Major Ltd., demolition contractors.

The excavating was done by Anglin-Norcross Ltd., and a depth of 20 to 25 feet was excavated for the foundation footings. No water was encountered, and the earth being dry and favorable, rapid progress was made at the start. The column foundations were of the spread footing type of concrete on which rests the structural steel grillage.



Insurance Exchange building, Montreal—Notre Dame St. view



Insurance Exchange building, Montreal—St. James St. view

The building has ten office floors and a basement and rises 134 feet. The height of the ground floor is 16 ft. 6 inches and that of the first floor 11 feet 9 inches; the remaining floors are 10 ft. 6 inches from floor to floor.

The exterior is ornamental, having large metal windows on the ground floor, and metal spandrels at the mezzanine floor level. The windows are of wood on the upper floors and very large; those in the court, surrounding the Molson's Bank, are metal, glazed with wired plate glass for fire protection. The windows comprise two-thirds of the exterior walls and this gives the 18,000 square feet area exceptionally fine lighting.

The design of the exterior of the two top storeys is somewhat different from that of the lower ones, the windows being of different design and there being considerably more ornamentation in the stone work. This additional ornamentation, together with a large copper cornice, greatly enhances the general appearance of the building.

The floors are reinforced concrete of the removable metal pan and concrete joist type, designed by the Trussed Concrete Steel Co. All floors with the exception of those in the public corridors and lavatories, will be finished in marble and terrazzo and the lavatories in ceramic tile. The public corridor runs from one main entrance on St. James street through to the entrance on Notre Dame street and is spacious and handsome, the floors and walls being in marble, and the vaulted ceiling being ornamental plaster.

The ground floor at the corner of Notre Dame and St. Peter streets will be occupied by the Molson's Bank and has a separate entrance of handsome design, thus cutting the bank off from the rest of the building.

The steam heating plant is in the basement and is being installed by the Garth Co., who will also put in the plumbing work. The basement will also contain the transformer and vacuum rooms for the power and ventilation of the building. The building is filled complete with Jenkins valves.

Four elevators are being installed by the Otis-Fensom Elevator Co. Ltd., and are of the latest type with a speed of 400 feet per minute.

The chimney is built of brick and forms part of the wall on the court side. On the east side, where the building adjoins the City and District Savings Bank, there is a light well, so that every office in the building will receive a sufficient supply of natural light.

The lighting fixtures will be of the latest scientific design and are being supplied by McDonald & Willson Co., Ltd.

The roof is Barrett specification 20-year guarantee and is being put on by Douglas Bros.

The architect who designed this building is Mr. D. J. Spence and the engineer in charge of the electrical work is Mr. Alex Wilson. The engineer in charge of the plumbing and heating is Mr. E. B. Plant.

The general contractors are Messrs. Anglin-Norcross, Ltd.

The Dominion Bridge Co. did the structural steel work and the ornamentation iron work was done by John Watson & Son, Ltd.

The marble work, tile and terrazzo is being done by the Wallace Sandstone Quarries, Ltd. The Canada Cement Co. supplied the cement used. The wood windows were supplied by Jas. Davidson Sons Co., of Ottawa, and the interior wood trim by Wm. Rutherford Sons Co., Ltd. The glazing was done by Pilkington Bros., Ltd. The trucking was done by Kendall Bros. Jas. Walker Hardware Co. supplied the hardware. The electrical work was done by the Canadian Comstock Co., Ltd.

Large Car Repair Shops in Toronto

The Toronto Transportation Commission Are Completing An Extensive Group of Buildings, the Chief One of Which is 467 by 452 ft.

One of the largest and most important construction jobs carried out in Toronto during 1923, has been the repair shops of the Toronto Transportation Commission at Bathurst St. and Davenport Rd. The general layout embraces a main building accommodating all shops concerned with the repair of the cars; a general stores building; an office building; a boiler house; a coal and ash handling plant and various subsidiary buildings such as oil stores, charcoal and sand storage, intersection shop, garage, scrap bins, etc.; also an office.

The main building comprises a covered transfer way, machine shop, wood working shop, paint shop, motor and truck shop as well as free stores area, lunch room, locker room and lavatories, etc. There are basements under the working shop, a portion of the truck and motor shop, the free stores area and the forge shop. The general dimensions of the building are 467′ 0″ x 452′ 0″.

The building is all under one roof. The construction is of steel frame with brick walls, and the roof is of precast gypsum block with saw-tooth monitors giving a north light. The floors are of concrete, wood blocks and mastic where appropriate and inspection pits are of concrete framed on steel columns and beams. The heating is by an indirect hot air system except in the paint shop where a direct radiation system is provided. A complete system of automatic sprinklers is provided throughout the building and a system of fire hydrants throughout the adjacent yard. As an auxiliary supply for fire purposes a 100,000 gallon tank is provided at the north-west corner of the property.

The boiler house is of similar construction as the main building and is connected to the main building by a pipe tunnel which also extends to the general stores building and office building.

Just north of the boiler house is a complete coal and ash handling plant comprising two concrete storage bins each of 500 tons capacity, fed from a track hopper with an apron feeder and elevator conveyor. A flight conveyor connects the bins with the boiler house coal bunkers.

A general stores building is located at the south-east corner of the site, fronting on Bathurst street.

The building is of reinforced concrete flat slab construction, 306 ft. long by 117 ft. wide, with a two storey extension at the west side to accommodate a shipping bay. The exposed street front on Bathurst street and the north and south elevations have a Queenston base and an artificial stone facing up to the top of the first storey windows. Panels between the windows and the upper floor in these elevations are of artificial stone of an ornamental character. The remainder of the facing is of brick.

Just north of the general stores building and fronting on Bathurst St., an office building has been erected, accommodating the superintendent of rolling stock and his staff, first-aid room and an employment office.

This building is 51′ 0″ x 82′ 0″, two storeys in height with a steel frame, brick walls and slate roof. The Bathurst street elevation has a stone base and artificial stone trim in keeping with the general stores building.

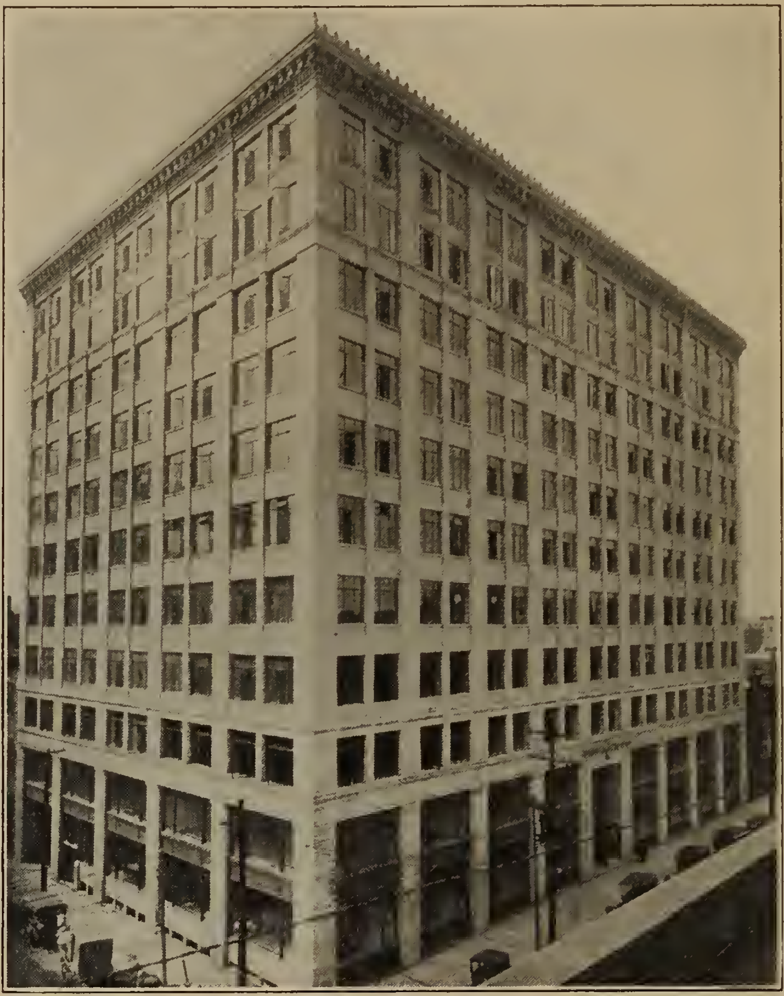
The following were the contractors on the repair shops, and boiler house and stores building:—General contractor, John V. Gray Construction Co.; structural steel, Dominion Bridge Co.; painting, Bavington Bros.; glass and glazing, Pilkington Bros. (Canada) Ltd.; gypsum block roof, Ebsary Gypsum Co.; ornamental iron, Dennis Wire and Iron Works; natural stone, Geo. Oakley & Son; Benedict stone, Canadian Benedict Stone Co.; artificial stone, Peerless Artificial Stone Ltd.; steel sash, Can. Metal Window & Steel Products Co.; drains, J. H. McKnight Construction Co., and Louis P. Acri; plumbing, heating, ventilation and sprinklers, W. J. McGuire Ltd.; sprinkler tank, Horton Steel Works; rolling steel doors, A. B. Ormsby Co.; counterbalanced elevator doors, Fireproof Door Co., Richards-Wilcox Canadian Co.; electric wiring, J. Everard Myers; millwork, T. H. Hancock Ltd.; boilers, Engineering & Machine Works of Canada; boiler settings, J. H. Wenting; radial brick stack, H. R. Heinike Inc.; feed pumps, John T. Hepburn Ltd.; stokers, Underfeed Stoker Co. of Canada, Ltd.; fans, Canadian Blower & Forge Co.; plastering, John Boyce & Sons; roofing and sheet metal, mastic floors, wood block floors, A. W. Carmichael Ltd.; tile and terrazzo, Italian Mosaic & Marble Co.; elevators, Otis-Fensom Elevator Co.; metal column forms, H. A. J. Aldington; face brick, Cooksville Shale Brick Co., and Don Valley Brick Works; reinforcing steel, Burlington Steel Co.; column spirals, Trussed Concrete Steel Co.; patent scaffolds, Drummond & Reeves Ltd.; Master Mix floor hardener, John Lindsay; hardware, Aikenhead Hardware Co., and Canada Hardware Co.; concrete, sand and stone, John E. Russell Co.; cement, Alfred Rogers Ltd., and Canada Cement Co.; inspection and tests, Canadian Inspection & Testing Co.; flashing blocks, The Barrett Co.

A general view of the main building of the car repair shops of the Toronto Transportation Commission

The following were the contractors on the office building:—General contractors, Sullivan & Fried; millwork, Myers-Warren Lumber Co.; steel sash, A. B. Ormsby Co.; Benedict stone, Canadian Benedict Stone Co.; structural steel, ornamental iron, McGregor & McIntyre; marble, tile and terrazzo, Italian Mosaic & Marble Co.; gypsum roof, Gypsum Roof Co.; lathing and plastering, W. J. Hynes Ltd.; rolling steel doors, kalamein and fire-doors, A. B. Ormsby Co.; painting, F. G. Roberts Co.; glazing, Toronto Plate Glass Co.; plumbing and heating, B. J. Miller Co.; drains, W. A. Richardson Co.; electrical work, Richardson & Cross; reinforcing steel, Baines and David, Ltd.; mastic floors, waterproofing, roofing and sheet metal, A. W. Carmichael Ltd.; excavating, Lioni & Co.,

The Federal Office Building, Toronto

Large Structure in Downtown Section is One of the Past Season's Most Important Achievements



One of Toronto's newest office buildings—the Federal

The illustrations herewith show the Federal building at the corner of Sheppard and Richmond Streets, Toronto, which is reported to be the largest office building in Canada. In appearance, with its white brick exterior, it is one of the most imposing structures of Toronto's down town section. It is eleven storeys in height above ground, of concrete frame construction and is treated on the street facades in stone up to the third storey, and white brick above. A very handsome cornice surmounts the whole building. It is U-shaped, a deep light well being provided on the south. It is fully fitted up with fast passenger elevator service and other facilities necessary to make it a most modern office structure. In a future issue more intimate details of the building will be given.

The contractors and suppliers of material were:—

General contractors, Yolles & Rotenberg; stonework, Hurst & Rogers; electrical work, Canada Electric Co.; electrical fixtures, Jeune Electrical Mfg. Co.; glass and glazing, Toronto Plate Glass Co., Ltd.; steel sash, kalamein doors, A. B. Orsmby; painting, A. Rowan; reinforcing steel for concrete, Burlington Steel Co.; Sand, stone, cement, John E. Russell; lumber, Mickle Dyment Lumber Co., Foley Lumber Co.; roofing, W. A. Moffat Co.; brick, Milton Pressed Brick Co., Don Valley Brick Works; elevators, Otis-Fensom Elevator Co.; elevator signals, Canadian Elevator Equipment Co.; mail chute, Cutler Mail Chute Co.; terrazzo floors, Italian Mosaic & Tile Co.; iron work, A. R. Lundy, Mahaffy Iron Works; sheet metal, H. Wolfe & Sons Furnace Co.; ventilating fans, Sheldons Ltd.; structural steel, Dominion Bridge Co.; interlocking tile, Interlocking Tile Co.; gypsum block, Ebsary Gypsum Co.; marble, Geo. Oakley & Sons,; vault doors, J. & J. Taylor; hardware, Canada Hardware Co.; lime, plaster, etc., Ontario Lime Co.; paint, Standard Paint Co.; weather stripping, Triplex Weatherstripping Co.; plumbing fixtures, Crane Ltd.; radiation, Imperial Radiation Co.; traps and valves, Darling Bros.; lighting shades, Jefferson Glass Co.; store fixture, Kent-McClain Ltd.; cornice, Galt Art Metal Co.

Ford Motor Co. Has New Assembly Plant

The Outstanding Piece of Industrial Construction Carried Out in Toronto During the Past Year

The Toronto assembly shop of the Ford Motor Company of Canada, Limited, on Danforth Avenue, is the outstanding piece of industrial construction carried out in Toronto during 1923. Commenced in February it was completed for occupation in November and at the present time just a few finishing touches are being put on.

The building is one storey throughout, of steel construction with saw-tooth roof and fitted with steel sash throughout. The general dimensions of the building are 500 ft. by 400 ft. and enough land adjoins it to enable an enlargement of equivalent size to be made at some future time when business warrants.

The foundations are reinforced concrete continuous footings for the walls and individual footings for the columns. The erection of the steel was carried out by means of two locomotive cranes which travelled on rails up and down the length of the building until the entire structural frame was erected. A compressor car provided air for the rivetting.

The exterior is of Milton wire cut brick trimmed with Indiana limestone base course, sills, lintels and pilaster coping pieces. The interior brick is Don Valley shale brick. The roof is of cement tile, the flat portions being covered with asphalt.

The flooring was built on the Kalman system by the Kalman Floor Co., of Chicago. A 1:1½:1½ mix was first screened out and then covered with burlap on which 1:1 mix of sand and cement was dusted over. By this means the concrete rapidly dried out and upon the burlap being removed, it was floated by means of an electric machine Three trowellings by hand then gave a very dense and smooth finish. The depth of the floor is 5 inches including one inch finish.

All the painting was carried out by means of a spray gun, one coat of primer and two coats of enamel being applied.

A portion of the building fronting on Danforth Avenue is used for offices, this space being divided from the factory by means of hollow tile partitions. The corridors and sales room in the office portion is finished with ceramic tile floors and oak panelling.

A loading platform adjoins the building on the west wall; along the south a track depression makes provision for shipping facilities. The train shed has a wood block flooring.

A separate power house provided with three Goldie & McCulloch oil-burning boilers supplies hot water for the heating system, the mains being carried to the assembly plant through a tunnel. The power house is also of structural steel construction faced with brick and lined inside up to a height of 7 ft. with glazed brick. The floor is of quarry tile bordered

The Ford assembly plant in Toronto

with terrazzo. A 100,000 gallon steel tank operates the sprinkler system.

Architect, Albert Kahn Ltd., Ford, Ont.; general contractors, Anglin-Norcross Ltd.; waterproofing, roofing, sheet metal and tin fire-doors, Geo. W. Reed & Co., Montreal; cement, Canada Cement Co.; stone, John E. Russell Co.; lime, Ontario lime Co.; brick, Milton Brick Co. and Don Valley Brick Works; cut stone, Ritchie Cut Stone Ltd., Hamilton; steel sash, rolling doors, A. B. Ormsby Ltd.; glass and glazing, Pilkington Bros., Hobbs Mfg. Co. Ltd.; painting, G. R. Knight, Montreal; reinforcing, Trussed Concrete Steel Co.; special floors, Kalman Floor Co., Chicago; Marble, tile and terrazzo, Italian Mosaic & Tile Co.; mlllwork, Armstrong and Strange; wood block floors, Jennison & Wright, Toledo, Ohio; special roofing, American Cement Tile Mfg. Co., Pittsburgh; hardware, Canada Hardware Co.; ornamental iron, Canada Wire & Iron Goods Co., Hamilton; lathing and plastering, R. C. Dancy; steel stacks, John Inglis Co.; hollow tile, National Fireproofing Co.; weatherstripping, Chamberlin Metal Weatherstripping Co.; excavating, Buonvivre Co.; plumbing and heating, Long & Edwards, New York; boilers, Babcock Wilcox and Goldie McCulloch, Ltd., Galt; boiler settings, J. H. Wenting; sprinklers, Automatic Sprinkler Co.; steel, Canadian Bridge Co.; fuel tanks, Horton Steel Works, Bridgeburg; electrical work, J. Livingston Co., New York; steel framework for machinery, McGregor & McIntyre, Ltd.; water tank, Canadian Des Moines Steel Co.; glazed brick for power house, Wm. Woollatt & Sons, Walkerville; heavy pipe and fittings, Crane Ltd.; pipe, Canadian Tube & Iron Products; pipe fittings, Beswick & Co. Addresses of all the above firms, except those indicated otherwise, are at Toronto.

Elgin Exchange of Bell Telephone Co.

An Eight-Storey Building Nearing Completion in Toronto —To House Automatic Equipment

The new Elgin building of the Bell Telephone Company at the corner of Sheppard and Temperance Streets, Toronto, is nearing completion. Although construction of this building may not have excited as much interest as it would have done were it erected on a business thoroughfare, the structure marks an epoch in the telephone business in Toronto. As a 'building' job it also introduces something new in construction. Incidentally, it should prove a creditable addition to Toronto's ever growing group of substantial downtown structures.

The frontage is the same—100 feet on both Temperance and Sheppard Streets. Eight stories is the limit of its present construction but the ultimate building will be twelve stories high.

When the building is completed it will be the largest automatic exchange building in Canada. It will have a capacity for six complete automatic units, which, in other words, means that it will house six complete telephone exchanges as the public understand a telephone exchange.

Simply stated, the difference between an automatic exchange and the present manual type central office is that mechanism instead of operators completes the connection between numbers. This naturally means that there must be in machinery the equivalent of operators. Anyone who has seen the inside of a manual operating room with its maze of wires and long stretches of switchboards, apparently laden with equipment, will realize that to replace this equipment with something that will automatically make connection is no small order.

Reduced to simple figures the automatic

The Elgin exchange building, Toronto

equipment must be equal to the present switchboard and other equipment, plus the skill, practice and brains of the staff of operators. However, there is no necessity for too much reflection on this task. It has been solved! The result is interesting to architects and builders who are faced with the necessity of providing a building to house this equipment.

Their first problem is the strength of the structure. This arising from the mass of equipment necessary. The strain on the floors of an automatic building is equivalent to a live load ot 150 to 400 lbs. per square foot.

As the result of this a much heavier construction is called for. The steel skeleton of the Elgin building is founded on thirty-seven concrete caissons, which go down 44 feet below the street level to bed rock.

Some 1,200 tons of steel were used in the erection of the frame work. Wind braces of course, are part of the structure.

The outside finish of the building is grey stone to the fourth storey level with brick beyond, which should result in an attractive looking building. The floors are of reinforced concrete. Window frames of hollow metal with wired glases and steel or metal doors will make the building as fire resisting as it is possible to make it.

The ordinary telephone building is constructed with great regard to fire prevention, but in addition to this precaution must be taken in an automatic exchange building to exclude dust and offset excessive humidity.

How this is being accomplished is quite another story which can best be told when the New Elgin building is completed. That should be soon. In the meantime, architects, contractors and engineers are satisfied that when they get through, Toronto will have one of the finest automatic exchange buildings on the continent. First in Canada for size and second to none for its capacity to resist fire, dust and humidity.

The following are the contractors and suppliers of materials involved on the job.

Excavating and foundations, Jackson-Lewis Co.; excavating sub-let to Storer & Donovan; cement and lime, S. McCord Co.; sand, Harbour Brick Co.; reinforcing, Baines & David; lumber, Myers Warren Lumber Co., Mickle Dyment & Son, Boake Mfg. Co., R. Laidlaw Lumber Co.; Steel, Dominion Bridge Works, Montreal; masonry, Jas. A. Wickett, Ltd.; brick, Jno. Price, Milton Pressed Brick Co.; terra cotta, Don Valley Brick Works; brick sand, Contractors' Haulage Co.; sand and stone, John E Russell Co.; metal windows and doors, A. Matthews Ltd.; roofing, Duthie & Sons; stairs and wrought iron works, Canadian Ornamental Iron Co.; plastering, W. J. Hynes Ltd.; marble and terrazzo, G. Oakley & Sons; carpentry, Wm. Munro & Son; painting and glazing, W. Bolus Co. Ltd.; plumbing and heating, W. J. McGuire Ltd. The addresses of all the above firms are Toronto, unless otherwise indicated.

Trinity College, Toronto—One of the Outstanding Jobs of 1923

Progress Made Under Federal Aid

What the Various Provinces Have Accomplished to Date in the Construction of Highways With Dominion Government Assistance

By GORDON GRANT
Chief Engineer, Canada Highways Commission

The conditions under which the federal subsidy had to be earned has effected a decided change for the better. The improvement of provincial trunk highways is now continuous instead of haphazard, with the result that a large mileage of continuously improved highway now exists in all provinces.

This act was passed in 1919 and was intended to encourage the construction and improvement of highways. Previous to the passing of this act, highway improvement in the various provinces was irregular and much in the same condition that it has been since roads were first made.

Due attention has also been given to the improvement of interprovincial connecting highways, in order to facilitate travel from one province to another.

In the meantime, I may say that all the provinces have been very busy on federal aid roads as well as on the improvement of county and township roads.

Taking the provinces from coast to coast the results since the passing of the act have been as follows:

British Columbia

This province has done sufficient work on its federal aid programme to completely exhaust its federal aid allotment of the $20,000,000 available under the Canada Highways Act. British Columbia's allotment is $1,251,955. (Allotments were made on a basis of population).

The approved provincial aid system consisted of 1,977 miles, from which federal aid projects could be selected. From this programme, some 25 projects have been selected covering about 300 miles, estimated to cost approximately $3,129,887, 40% of which would be federal aid funds.

Saskatchewan

This province has an extensive road programme for the improvement of main highways under federal aid. Their programme embraced some 7,000 miles of highways and their allotment under the Act, was $1,806,255. The province would have to expend, of their funds, $2,709,382 or a total of $4,515,637, or sufficient to complete about 1,000 miles of highway at the provincial standard for ordinary graded roads, some of which would be gravelled, wherever gravel is available in a reasonable haul either by teams or railway. This province may exhaust its federal subsidy by the end of next season.

Manitoba

The Federal aid allotment there is $1,602,265, which, with the provincial share, will amount to $4,005,662. Their programme consists of 4,000 miles, from which projects for improvement may be selected.

The above sum should complete about 800 or 900 miles of road. Road work in Manitoba costs more per mile than it does in Saskatchewan as a far larger mileage is gravelled, Manitoba being more fortunate than the sister province in having large deposits of excellent gravel distributed throughout the province.

This province may probably also exhaust its federal subsidy by the close of next season.

Ontario

The provincial programme consists of 1,824 miles to be improved with federal aid. The quota of the federal subsidy is $5,877,275; provincial quota, $8,815,912; total, $14,693,187. It is expected that this will be entirely exhausted by the end of 1924, when there should be approximately some 600 miles of completed federal aid highway, which will be surfaced with asphalt, cement concrete, macadam or gravel in accordance with the present or anticipated traffic over the different sections of highway.

Quebec

The Quebec federal programme involves some 2,950 miles, of which a considerable mileage of the more important roads has been completed, and active operations are being carried on on the uncompleted sections of these roads. Various classes of surfacing, including asphaltic, cement concrete, macadam and gravel have been used.

Macadam and gravel, however, are the most favored classes of surfacing in this province, as, owing to the great mileage being improved, the more expensive surfacing is prohibitive owing to the great cost involved.

This province will also, by the end of next season, exhaust their federal subsidy, which amounts to $4,748,420.00, when there should be about 700 miles of completed federal aid roads.

New Brunswick

The federal aid programme of this province involved some 1,371 miles, but of this a considerable mileage had been previously improved before 1919 and active operations have since been carried out. This province is fortunately situated in having, in nearly all sections of the province, an abundant supply of good gravel for road surfacing purposes, so that by the end of next season, when the whole of the Federal subsidy, amounting to $1,163,845 will have been earned, a large and well distributed mileage of excellent gravel roads will have been completed, but considerable further expenditure will be required before the whole system of main provincial highways can be completed.

There may, however, be some 500 miles completed by the end of next season.

Nova Scotia

Their federal aid system comprises some 900 miles of trunk roads. The federal subsidy is $1,468,720. By the end of 1924, this will have been earned and probably over 500 miles of the system will have been completed. The surfacing consists principally of gravel, with a considerable mileage of macadam.

Prince Edward Island

Their federal aid programme involves 850 miles of trunk roads. The federal subsidy is $603,455. It would appear that this may not be exhausted by the end of 1924.

Road improvement in this province is much handicapped by the entire absence of rock or gravel. Hard material for surfacing, if used, must be imported from the adjacent provinces, which makes the cost prohibitive for all sections except those immediately adjacent to cities and towns.

By the end of 1925, there should, however, be some 250 miles or more re-graded and improved earth roads completed.

Statistics of Canadian Road Work

Reports from the Provinces Covering Their Expenditures for This Year, and in Some Cases, Proposed Expenditures for Nineteen Twenty-Four

This article is entirely devoted to statistics showing the approximate expenditures on highways, bridges, ferries or other means of road communications in the nine provinces of the Dominion during the years 1922 and 1923, and in some cases earlier. The figures are official, having been secured directly from the various highways departments, or from the Canadian Good Roads Association. They are both interesting and encouraging, as showing the general recognition by the different provincial governments of the wisdom and necessity of building and maintaining as many miles of highway as is consistent with their financial resources in order that road travel for both local and interprovincial purposes shall be served as far as possible, and that full facilities be given for the interchange of natural produce and social amenities by transportation methods which are constantly increasing in use and public favor and which have now assumed the important place to which they are entitled by reason of their economy and their convenience. No detailed analysis of the figures is being attempted, nor is any necessary, for they speak for themselves. Nor is any comparative summary possible, owing to the differences in the organizations, the road classification and the varied details of the highway departments of the separate provinces. It is sufficient to note that the grand total for the nine provinces is a little over $35,000,000. Without further preface the statistics are herewith presented:

Ontario

With regard to the situation in Ontario, G. C. Parker, Secretary of the Ontario Department of Public Highways writes as follows:

"With regard to an estimate of the expenditure on roads in the province for the year 1924, it is impossible for us to give you figures, as appropriations for work on county roads and township roads, are usually made at the January sessions of the county councils and until these amounts have been decided upon, the expenditure for the year is impossible to estimate.

"The estimated expenditure on provincial highways for 1924 is also difficult to arrive at, as the amount of work that will be done by this department, has not yet been decided and until the schedule of work for the season has been approved, any estimate would be impossible.

"Owing to the fact that the present season has not yet closed, the expenditure for 1923 can only be estimated. We do not receive the statements of expenditure from the counties until next spring and any figures concerning this year's work are consequently approximate.

"The same may be said of the expenditure on provincial highways for 1923. A considerable amount of work is still going forward and some of it will continue up till the end of the year.

"The following schedule, therefore, shows what we consider will be the approximate expenditure on roads of various classes coming under the attention of this department, for the year just closing. It should be distinctly stated that the figures are not actual expenditures, but are estimates:

	Estimated Expenditure 1923	Estimated Provincial Subsidy
County roads	$ 4,770,000.00	$ 1,908,000,00
County suburban roads	1,020,000.00	408,000.00
Provincial county roads	2,050,000.00	1,230,000.00

Provincial county suburban roads....	600,000.00	360,000.00
Township roads	3,800,000.00	760,000.00
Provincial highways.	14,000,000.00	11,200,000.00

Manitoba

The amounts expended by the Province of Manitoba for road work performed under the operations of the Good Roads Act of the Province, as compiled by Mr. A. McGillivray, Highway Commissioner, are as follows:

Year	New Construction	Renewals	Maintenance
1920	$2,452,694.00	....	$15,600.00
1921	2,514,464.82	....	22,500.00
1922	1,682,205.16	....	28,218.00
1923	883,320.00	....	45,000.00

Total road mileage .... 74,000 Miles
Mileage open for traffic, approximately. 25,600 Miles
Mileage improved to end of season 1922 under the Good Roads Act of the Province .... 3,050 Miles

Note:—The above expenditures represent the monies spent on roads improved by the province and the various municipalities under the provisions of the Good Roads Act, only. No record is available in the provincial department of the monies spent for construction or maintenance annually, by the rural municipalities on other roads.

The expenditures above given for maintenance represent the monies spent in improving such roads that have been designated as provincial highways and towards which the province assumes two-thirds of the cost of maintenance.

Expenditures for 1923 are to August 31st.

Quebec

Mr. J. L. Boulanger, deputy minister of highways for the province of Quebec, forwards the following statement showing in round figures the total amounts expended by the province for road work in the years given:

Year	New Construction	Renewals	Maintenance	Total
1919-20 ..	$ 3,700,000	$ 100,000	$ 1,000,000	$ 4,800,000
1920-21 ..	5,350,000	200,000	1,000,000	6,550,000
1921-22 ..	5,300,000	165,000	875,000	6,340,000
1922-23 ..	5,800,000	1,600,000	1,100,000	8,500,000
1923-24 (anticipated) ..	5,600,000	1,900,000	1,300,000	8,800,000
Total ..	$25,750,000	$3,965,000	$5,275,000	$34,990,000

Total road mileage, Province of Quebec. 45,000 miles
Total road mileage improved in the Province of Quebec up to 1922:
Earth roads .... 15,000 miles
Gravel, macadam, concrete, etc. ...... 4,660 miles

With regard to next year's expenditures, Mr. Boulanger writes: "The Quebec Roads Department will spend approximately $6,000,000.00 for road work during the coming season distributed as follows:

1. Construction on roads forming part of the main roads system of the Province, about $3,000,000
2. Resurfacing and repairs, about 1,000,000
3. Maintenance of provincial and municipal roads, about 2,000,000

Alberta

Mr. J. D. Robertson, deputy minister of roads for the Province of Alberta, gives the following figures:

Roads

Year	Construction	Maintenance	Total
1920	$ 651,615.22	$ 313,992.53	$ 965,607.75
1921	1,294,883.78	115,842.83	1,410,726.61
1922	569,747.90	57,395.43	627,143.33
1923 (Estimated)	250,000.00	130,000.00	380,000.00

Bridges

Year	Construction	Maintenance	Total
1920	518,196.65	....	518,196.65
1921	602,048.58	76,017.73	678.066.11
1922	501,899.52	52,724.63	554,624.15
1923 (Estimated)	310,000.00	45,000.00	335,000.00

Ferry Service

Year	Construction	Maintenance	Total
1920	22,673.18	64,336.53	87,009.71
1921	69,495.24	22,177.66	91,672.90
1922	7,085.07	60,507.50	67,592.57
1923 (Estimated)	12,500.00	62,500.00	75,000.00

Miles of continuously graded road 16,000
Miles of road improved and opened for traffic but not continuously graded throughout.. 28,500
Miles of prairie trail 15,500
Miles of legal road allowance in the settled portions of the Province not yet opened for traffic 80,000

Total mileage in the settled portions of the province only 140,000

Nova Scotia

Mr. R. M. McCology, chief engineer of the provincial highway board, reports as follows on highway construction in the province of Nova Scotia:

	Expenditure on Roads Reconstructed to Dominion Aid Standard	Expenditure on Roads Reconstructed Soly With Provincial Funds	Maintenance	Totals
1920	$ 888,737.26	$1,300,620.15	$ 748,504.61	$2,937,862.02
1921	1,387,234.79	724,572.71	591,517.11	2,703,324.61
1922	1,534,578.08	529,697.97	530,437,67	2,594,713.72
1923	1,300,000.00	360,000.00	1,350,000.00	3,010,000.00
Grand Total				$11,245,900.35

Note:—The above amounts do not include monies expended for construction and maintenance of bridges and culverts.

Total mileage of D. A. roads constructed and under construction at Dec. 31st, 1922 467.67 miles
Approximate mileage 1923 programme .. 200.00 "

Total mileage, Dominion Aid roads 667.67 "

Provincial loan mileage constructed (1920) 1,318 miles
" " " " (1921) 500 "
" " " " (1922) 633 "
" " " proposed (1923) 300 "

" " Total mileage (reconstructed) 2,751 "

Total mileage of all roads, province of Nova Scotia .... 15,000 miles

Prince Edward Island

Mr. H. H. Shaw, chief engineer, forwards the following report on the total amount expended by the province of Prince Edward Island for road work:

Year	New Construction	Renewal	Maintenance	Total
1920 ..	$105,527.12	$44,423.48	$85,363.96	$235,314.56
1921 ..	288,479.55	39,742.43	88,301.85	416,523.83
1922 ..	289,656.15	18,258.42	78,979.25	386,893.82
1923 (Anticipated)	250,000.00	20,000.00	92,000.06	362,000.00
Total road mileage				3,650 miles
Total road mileage improved				300 miles

Saskatchewan

Mr. H. S. Carpenter, deputy Minister of Highways for the province of Saskatchewan, writes as follows:

I am sending herewith the expenditure of Highways for the years 1920, 1921 and 1922, and the estimated expenditure for the year 1923. These expenditures include the construction, renewal and maintenance of roads and bridges and the ferry system, and also cover the surveying of new and old roads:

1920	$1,689,780.00
1921	$2,389,018.00
1922	$2,098,000.00
1923 (Estimated)	$2,118,000.00

With regard to expenditure upon maintenance; from the above sums it may be said that the Department expends $400,000 per annum on maintenance of roads, bridges and ferries.

Regarding renewals in this Province: this is rather a difficult question to answer. We might say that the majority of the capital account bridges are renewals, and some of the roads which we have placed in "maintenance" might be regarded as renewals. These roads, of course, are of earth construction, so that disregarding the latter and dealing only with bridges on the capital expenditure, we might say that the renewal works undertaken by the Department from the above mentioned sums amounts to an average of over $100,000 per annum.

Road Mileage in Saskatchewan

Provincial Highway System ...	7,000 miles
Main market roads	25,000 miles
Lateral and feeder roads	170,000 miles

The estimated total of the Provincial Highway System completed by the end of 1923 was 1,075 miles.

Practically the whole of the main market road mileage is improved. It is not possible for me to give you the total mileage of the lateral or feeder roads improved, as these roads are under control of the rural municipalities.

For a more complete review of the situation in Saskatchewan, see the Contract Record of Nov. 28, page 1130.

British Columbia

The total amount expended by the province of British Columbia for road work, as reported by Mr. J. Philip, public works engineer, is given hereunder:

	New Construction	Renewals & Maintenance	Total
1920-21	$1,487,624.57	$1,494,473.57	$2,982,097.14
1921-22	1,620,018.73	1,273,682.70	2,893,701.43
1922-23	1,875,495.40	1,407,589.59	3,283,084.99
1923-24 (Anticipated	2,015,000.00	1,326,500.00	3,341,500.00
Total road mileage province of British Columbia			15,969.31 miles

New Brunswick

Mr. B. M. Hill, Provincial Road Engineer for New Brunswick, furnishes these figures showing the total amounts expended by the Province of New Brunswick for road work:

	New Construction	Maintenance	Total
1920			
Roads	$1,340,000	$407,000	$1,747,000
Bridges	550,000	322,000	872,000
1921			
Roads	1,220,000	410,000	1,630,000
Bridges	730,000	370,000	1,100,000
1922			
Roads	860,000	290,000	1,150,000
Bridges	400,000	265,000	665,000
1923	Not compiled.		

Total mileage, province of New Brunswick	15,000 miles
Trunk Roads	3,600 "
Byroads	11,400 "
Total road mileage improved	5,000 "
Trunk roads	2,000 "
Byroads	3,000 "

Cost per Mile of Canadian Roads

Ontario, of all Canadian Provinces, has the most costly system of highway construction, according to the annual report of A. W. Campbell, Chief Commissioner of Highways for the Dominion. The report covers the fiscal year 1922-23, and gives the average cost per mile for highways, under the Canada Highways Act projects in the various Provinces, as follows: Ontario, $34,252.39; British Columbia, $23,918; Quebec, $10,840.58; Nova Scotia, $5,730.15; Manitoba, $3,895; Prince Edward Island, $2,719.49; Saskatchewan, $2,199.16. During the year under review 112 projects were agreed to, covering 1,206.94 miles, at a total cost of $9,265,055.27, toward which the Dominion's contribution would be $3,706,022.11. The average cost per mile as a whole was $7,676.43.

E.L. Miles Now F.R.S.A.

E. L. Miles, M.E.I.C., and member of the Association of Professional Engineers of the Province of Ontario, at present county road superintendent and county engineer for Victoria, Ontario, was elected a Fellow of the Royal Society of Arts, London, Eng., on November 7th, 1923.

This society was founded in 1754 and incorporated by royal charter in 1847 with the Royal consort H.R.H., Prince Albert of Saxe Coburg and Gotha, as its president. At the present time H.R.H., the Duke of Connaught and Strathearn, K. G., is president of the society, and Lord Asquith, K.C.B., K.C., D.C.L., chairman of the Council.

Big Building Program Under Way and in Prospect for University of B.C.

Work on $750,000 Science Building Resumed This Year and the Library Also Started—Other Units of the Scheme Are Planned—Special Methods of Handling Materials on the Job

"There has to be a beginning for everything and we are making a start here with our science building on a university group, which, I believe, will be not only a credit to British Columbia, but to all Canada."

In these words, Chancellor R. E. McKechnie of the University of British Columbia, at the laying of the corner stone, recently, epitomized the viewpoint of the provincial government, the faculty and the people of the province, in regard to the science unit, first of the permanent group of buildings of the U. of B. C. Besides this, the laying of this construction cornerstone marked the successful culmination of years of effort on the part of all interested to have a start made on a group of educational buildings of which the province could boast and which would be worthy of the use to which they would be put.

Some time before the war, the government of British Columbia, after representations and urgings that spread over several years, finally announced that a start would be made on an elaborate group of buildings in Point Grey, to be known as the University of British Columbia. Following this announcement, a world-wide competition was held for the most comprehensive and appropriate designs and plans for this group, which the authorities wished to make distinctive, both in beauty of architecture and in usefulness. This competition finally wound up with the designs of Sharp and Thompson, architects, of Vancouver, being the choice. The winning architects adopted the early tudor style of architecture for the whole university group.

The science building was chosen as the first unit to be erected, and when detail plans and specifications were completed, a contract was awarded and a start made on the big structure. However, just as the skeleton was completed and covered with concrete, the war broke out and work was ordered to be stopped. Nothing whatever was done from then till just before the fall session of the legislature in 1922, when a very strong campaign was started by the faculty and students of the U. of B. C., to bring pressure to bear on the provincial authorities and have work again started on the permanent group of university buildings. The success of this campaign was marked by the award of the contract, for the completion of the science building, early in 1923.

Work Resumed This Year

For the completion of the first unit of this building scheme, the government gave the contract to the E. J. Ryan Contracting Company, of Vancouver, on a percentage basis, the object being to save the loss of time in calling for tenders and also because plans were not completed for the science amphitheatre, demonstration and testing rooms, and physic laboratory. The cost of this structure, which is now fast approaching completion, will be approximately $750,000.

Construction used in this big science structure is of steel and reinforced concrete, with the exterior finish of random range granite of several different shades of color. The building is 60 by 270 feet in size, with a width over a central wing of 112 feet, and it will be four stories high. The interior of the building is so designed that the laboratories will take up the major portion of the room. Each laboratory is equipped with students' work benches, which will be equipped with electricity, hot and cold water, gas, air and other equipment necessary for the carrying on of the studies involved.

The larger part of the sub-trades were awarded by the general contractors. The first subtrade let, and the second largest in cost, was the supply of native granite, which was given to Keast & Allan, of Vancouver, at a figure of approximately $105.000. It involved the cutting of about 35,000 cubic yards of granite of varying shades for the color scheme proposed for the exterior by the architects. This stone is from the Nelson Island quarries.

Steel sash, casements, etc., were the next on the list, and of the various firms bidding on these, that of an eastern firm, the Architectural Bronze & Iron Works, of Toronto, was accepted. A figure of about $22,800 was submitted. This work involved the supply and erection of all the steel sash, casements complete with leaded lights, glazing beads, mullions and transoms.

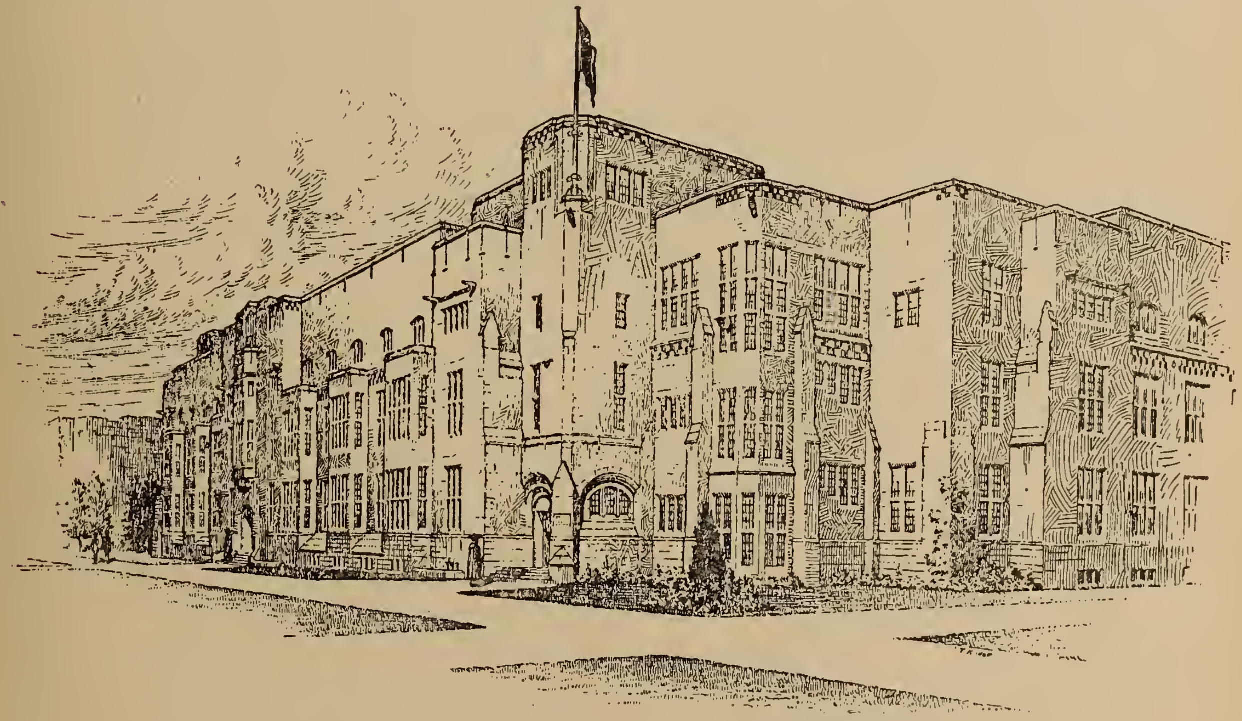
Campbell & Grill, Vancouver, succeeded in getting the award of the roofing and sheet metal work, costing about $14,000. A special roofing, the only one of its kind in the province, was specified, it being Val de Travers asphalte. The sheet metal work was composed of flashings, drains and water pipes of 16 ounce cold rolled copper.

The marble work was awarded to the Continental Marble Co. Ltd., at $12,000, while the tile work was secured by the Wm. N. O'Neil Co. Ltd., of Vancouver, at $18,000. In this latter work there was used a large quantity of faience and wall tile for wainscoting of corridors, while 9-inch heather brown Welsh quarry floor tile was put on the floors and thresholds. The floors of the locker rooms and lavatories are to be done in white ceramic floor tile, while a quantity of cream glazed wall tile is to be supplied for dado and wainscoting.

The largest sub-trade placed on the science building was for the heating and ventilating systems, this work going to Barr & Anderson, Ltd., Vancouver, at a figure of $118,000. The high cost is due to the intricate systems being installed. This is also the case in the plumbing contract, which was given to Murray Bros. Ltd., Vancouver, for $65,000.

The electrical system is being installed by Hume & Rumble, New Westminster, for $55,000.

At the time of the laying of the corner stone late in September by Hon. J. D. MacLean, Minister of Education for British Columbia, the stonework on the rear wall and two end walls of the building had been practically completed and a start made on the stonework of the front wall. By the middle of December this stonework on the front of the building, which is naturally considerably more intricate and ornate than on the other walls, had reached the height of the second story. Architects and construction experts who have inspected the building so far all agree that it will be a most beautiful and imposing structure when completed and a worthy initial unit of what will undoubtedly be a splendid university group.



The new Science building of the University of British Columbia, as it will ultimately appear

Library Building

Second of the permanent units of the group of university buildings to be undertaken by the provincial government is the library building. This structure is so designed that it can be erected on the unitary method, without interfering with the use of any part, or necessitating structural changes in the future. Thus it was that tenders were called for the central portion of the big unit, and the general contract was awarded to the lowest bidder, the E. J. Ryan Contracting Company, Ltd., Vancouver, whose original tender on the structure was $461,500. This bid, however, was considerably above the estimated cost, and a number of changes and a general revision were made to the designs, as prepared by Sharp & Thompson, the architects, to bring down the cost to $417,000 which was nearer the original estimate of $400,000.

The excavation work for the foundations of the big building was completed some time ago by the Ryan Company, under a separate contract, and on receiving the award of the general contract, a start was immediately made on the installation of the foundations, which are now all completed and work commenced on the superstructure.

The site for the library lies immediately north of the Science building, now nearing completion, the main facade facing towards the west, overlooking a quadrangle about 200 feet deep, and laid out with grass and shrubs, and open at the end towards the main hall.

Design of the Building

Construction of the building will be carried out in incombustible materials, with reinforced concrete frame, faced with random range Nelson Island granite with dressings to doors, windows and architectural features. Walls of tile roughcast will be at the ends where they will afterwards be masked by future wings. The central wing will be three stories, 100 by 120 feet in size, and somewhat cruciform in ground plan. The two wings will later give it a total frontage of 280 feet.

Internally the concourse will have an open timber roof finished in B. C. native woods. Decoration will be reduced to the minimum, which is the modern practice of library design. Effect will be produced by a pleasing proportion of voids and solids in good materials rather than elaborate plaster and other decoration, which tends to destroy the uses for which a library is primarily designed, viz: study and research.

The main reading room floor consists of an open concourse measuring about 50 by 100 feet, with two reading rooms immediately leading therefrom, each 30 by 50 feet, which together will give accommodation for about 300 readers. The plans allow these to be automatically divided into two departments, one for general reading and the other for required reading, both having access to the loan desk and catalogue room. The loan desk is directly connected to the stock room and lies on the east of the concourse.

Future wings housing the permanent general and required reading rooms will be north and south of the concourse and entered directly therefrom. These wings, when built, will allow the space now taken up in the central unit by these two rooms to be given to periodical and browsing rooms, with the catalogue cases in the concourse directly opposite the loan desk.

Lower floors of these two wings will house permanently the librarian and staff, seminar rooms, document and map rooms, and the depository catalogue of the library of Congress. The space now allotted to the librarian in the central unit will be given to seminar rooms and rooms for special collection.

The basement floor is taken up with men's and women's cloak and locker rooms and toilets, fan room and lower tier of stackroom.

All floors connect with the stackroom, which will be constructed with steel stacks of the most modern type with accommodation for about 67,000 volumes. This will allow about 15,000 increase over the number of volumes in the University library when moved to Point Grey. Room for future stack expansion by future units has been properly provided for.

Each floor of the stack room has accommodation for a number of study carrels, where students with special privileges can study without any interruption and about sixty will be provided in the first unit.

Other Buildings

With the science building near completion and the contract awarded and a start made on the construction of the library building of the permanent group of structures to compose the University of British Columbia, the attention of the government is now being centred on a number of semi-permanent buildings to be erected and used until such time as sufficient funds are available for more of the permanent structures. This group of buildings, which are being designed by the public works department of the provincial government, as they are not included in the structures being planned by the architects, Sharp & Thompson, has been estimated to cost between $400,000 and $500,000.

There will be four large buildings in the group, all of which will be connected with covered passageways so that ready intercourse will be possible in wet weather. While the structures are described as of a semi-permanent nature, they are to be quite substantial and estimated to have a useful life of from 20 to 25 years, as it is expected that by that time, the university will be able to finance more pretentious buildings of a permanent nature. Construction of these semi-permanent buildings will be of frame with stucco exterior finish, and the interior finish of slow-burning type. They will be along early Tudor lines in keeping with the style of architecture adopted by the architects for the permanent group of university buildings. The structures are intended to house the arts and agricultural departments, as well as providing an administration building and a combination convocation and dining hall.

Tenders are to be called early in the New Year for the erection of all four of the semi-permanent structures, which are to be included in one contract and not in separate contracts as at first thought.

Central Heating Plant

Plans are not quite completed as yet by the architects, Sharp & Thompson, for the third permanent unit of the university group, which is to be the central heating plant. Tenders for this building, which has been estimated to cost approximately $200,000, are to be called early in the New Year. Despite its utilitarian nature, the building that will house the heating plant will be designed to harmonize with the rest of the permanent structures in the university campus group. It will be of fire-proof construction, with the exterior faced with native granite, the same as the other buildings. This will be the first unit of what will be known as the engineering group.

Town Planning of Point Grey

At the same time as the attention of the building contractors is being turned to the buildings being erected on the university site, other contractors are watching with close interest the government's scheme for the town-planning in the district. An elaborate scheme is being outlined, for the laying out of the section about the university.

About 160 acres of land has been cleared by the government, of which about 100 acres are for the residential district. The first development of this will be the building of sewers, roads, sidewalks and boulevards before the property is put on sale. There will be about 200 residential lots, including a small business section, which, however is only tentative. Regarding the business section, it is suggested to keep it separate and to control the class of business.

A big expenditure will be necessary in constructing roads, sewers, and light lines to this section to be developed, as well as street car lines.

Materials Handled by Aerial Tram

One of the most unique features in connection with the construction of this entire group of university buildings is the means which have been adopted of conveying the hundreds of thousands of tons of building material to the site. To have hauled these great quantities of building material out to the tip of Point Grey by motor trucks or team would have necessitated either constructing a hard-surfaced road some five or six miles in length, which in itself would have meant an expenditure running over $100,000, or the alternative of hopelessly cutting up the existing roads of Point Grey with such heavy traffic.

Realizing that some more direct means of transport for the building material was required, the engineers of the E. J. Ryan Contracting Company decided to take advantage of water haul as much as possible, and evolved a radical but practical combination of aerial tramway and railway for landing all material right on the site with the minimum of handling and economy of transport.

The system first of all involved the construction of a wharf on the southern shore of English Bay at a point on the Point Grey promontory nearest to the university site. After being landed here direct from scows, the stone, cement and other building materials are taken direct into the buckets of an aerial tramway approximately 1,000 feet long. This tramway surmounts an elevation of some 400 feet along the foreshore and lands the material at the terminus of a specially built railway half a mile in length, which runs direct to the site. Switching tracks have been laid by which the various materials are conveyed direct to storage bunkers from which they are drawn by gravity wherever practicable.

This aerial tram and railway cost in the neighborhood of $18,000 to instal but will pay for itself many times over before even the first three units of the university group are built. It not only handles the material expeditiously and prevents congestion at any point, but the aerial tram and railway cars have been designed to carry individual loads of nearly two tons, if required. This allows large single pieces of cut stone to be taken in without danger of breakage.

Imposing Apartment in Vancouver

Y.M.C.A. Building Converted into a 123-Suite Apartment House —Details of the Design and Construction

The St. Julien apartment building, situated on Georgia Street, Vancouver, was the original proposed new home of the Y.M.C.A., for which, in spite of all its efforts, the Association was unable to raise sufficient funds during the war to complete, with the result that the building was finally handed over voluntarily to the creditors.

A company was then formed under the name of the St. Julien Co. Ltd., with Mr. J. H. MacGill, barrister, as secretary, which had plans prepared by H. S. Griffith, architect, to convert the structure into an apartment building. Soon after the necessary funds to complete the building were obtained from Messrs. Carstens & Earles, Inc., and Bond & Goodwin & Tucker, Inc., Seattle.

A general contract was entered into with Messrs. Booker, Campbell & Whipple Ltd. for $270,000 to complete the building within six months. Good progress has already been made in the necessary preparation and alterations and several sub-contracts have been let, viz.: heating and plumbing to the University Plumbing & Heating Co., Ltd., Vancouver; the roofing, cornices, metal windows, doors and ventilators to Campbell & Grill, Seymour St., Vancouver, and two elevators to Messrs. Peterson & Cowan, Dominion Building, Vancouver; the electrical work is being carried out by day work. The contracts for painting, plastering and millwork have not yet been let.

The building, as seen in the cut, has an imposing frontage on Georgia Street, 132 ft. wide, with 132 ft. frontage on Alberni St. by 131 ft. deep. It is seven stories high above the sidewalk with 11 ft. basement, is built of reinforced concrete on the Turner mushroom system, is faced with ornamental terra cotta on the first and top floors, and with red paving brick between. The light courts are 18 feet wide, constructed of hollow tile and coated with cement plaster.

When completed the building will have 123 suites mostly of two and three rooms, each living room being fitted with a disappearing bed, giving the suites the accommodation of an extra room. The living rooms are in general larger than usually found in apartment buildings, ranging from 15 x 24 to 22 ft. square. The kitchens are planned with breakfast alcove, table and seats for four, and provided with gas stoves, sinks, cabinets and drainage for refrigerators. The plumbing fixtures are of the most modern type and will be furnished with cabinets. The elevators are commodious, one of automatic push button type, the other for attendant with all safety devices. There will be a house telephone in each apartment with an exchange in the manager's office on ground floor. To each suite will be supplied cupboards for garbage cans, and another for groceries and parcels with access from hall and suite.

Heating is provided from twin boilers in the basement with oil-tank connection under the sidewalk, of low pressure steam, vacuum or vapor system.

The St. Julien Apartment, Vancouver, as it will appear when completed

When completed this enterprise will have incurred an expenditure of over $700,000.00 and will be a very desirable addition to the apartment accommodation of the city, which is already evidenced by the number of enquiries for suites.

New Pump Saved Heavy Fire Loss

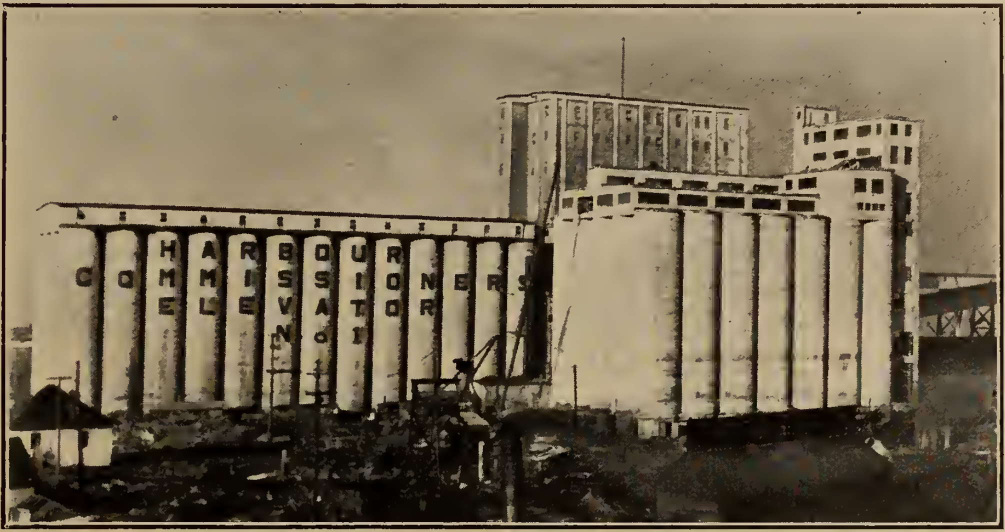
On October 14 last, what was said to be the most disastrous fire in the history of Galt, Ont., swept over the manufacturing district of the city, causing a loss of $250,000 to the plant of P. W. Gardiner & Son, planing mill operators and sash and door manufacturers. That the damage was not heavier was due to the splendid service rendered by a new type of pump manufactured by Babcock-Wilcox and Goldie-McCulloch, Ltd., of Galt, which was brought into action in time to prevent more disastrous loss. In writing to the manufacturers of the pump, Mr. J. E. Gardiner, manager of P. W. Gardiner & Son, writes: "We have no hesitation in saying that we believe our main factory would have been destroyed but for the excellent work of the pump."

The unit is designed for fire service in towns and villages where a supply of water can be obtained from a stream or reservoir with a moderate suction lift or could be used as a booster pump where city water pressure would not be sufficient to give good fire streams, the suction of the pump in this case being connected to a hydrant by a flexible suction hose.

The pump is of the Rees Roturbo patent pressure chamber, two stage voluto type as is also used by the Seagrave Company of Columbus, Ohio, and Leyland Motors Ltd., of Choxley Lane, England, on their pumping engines, which have taken highest honors in fire fighting apparatus of this type. With the gasoline engine running at 1,000 revolutions the pump is designed to give two 7-8 in. streams using 100 feet of 2½ standard hose. Actually at the P. W. Gardiner fire two 1 1-8 inch streams were being delivered with 500 feet of hose between pump and nozzles.

Large Addition to Government Elevator at Vancouver

Within Four Months from Commencement of Construction, Elevator is Completed and Ready to Receive and Discharge Wheat



Above is a photograph of the new concrete elevator of 840,000 bushels capacity built for the Vancouver Harbor Board in four months by the Pacific Construction Company, and which will be used as a unit of the old elevator. Machinery installation for receiving and discharging grain is now completed and the building will be turned over officially to the Harbor Board on January 1st. It is 160 feet high, has 63 separate bins and will increase the discharging capacity of the old elevator by 50 per cent. With this new addition the storage capacity of the government elevator now amounts to 2,000,000 bushels.

THE PACIFIC CONSTRUCTION CO. LTD.

VANCOUVER, B. C.

We design and build

GRAIN ELEVATORS

of the

Latest Type

Engineers

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Specialists in Harbour Work and Heavy Concrete Structures

We have the

LARGEST DREDGING EQUIPMENT

in

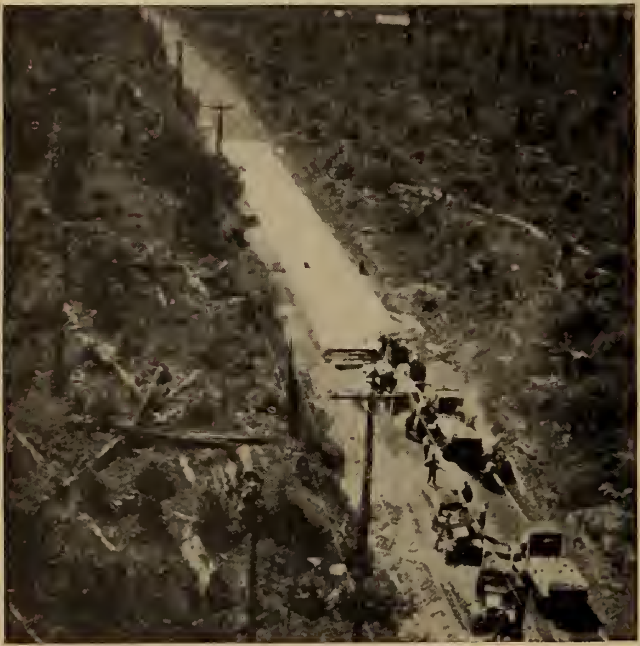
British Columbia

Contractors for Vancouver Harbour Commissioners' Elevator

Cloverdale-Blaine section of the Pacific Highway, looking south

British Columbia Paves Pacific Highway with Concrete

8-1/2 Mile Contract Completes Road to International Boundary—The Contractors Used Interesting Construction Methods—Carried Out Under Direction of Provincial Government



Looking down on Pacific Highway during paving operations

With the award of about 8½ miles of 18-foot concrete pavement in March of this year, the Provincial Government of British Columbia provided for the completion of the Pacific Highway through to the International Boundary between Canada and the United States. With the completion of this work last September, there is now a continuous pavement from Vancouver, B. C. to the Mexican border, a distance approximately 1,600 miles.

This contract called for 90,000 square yards of concrete, part seven inches thick and part seven and one-half inches. In carrying out this work the contractor, A. B. Palmer & Co. Ltd., hauled proportioned batches, three or four boxes to the truck, depending upon its size, from bunkers which were served from a high line track, the cars loaded with aggregates being pushed up the incline and dumped directly into the bunkers. Sand and pebbles from the Fraser River were used.

For the grading preparatory to laying the

A stand of virgin forest known as the "Green Timber," near New Westminster on the Pacific Highway

CLAYBURN

BRICK

For the

University of

British Columbia

Beauty of design and permanence of construction are the outstanding features of the buildings now in course of erection for the University of British Columbia.

Brick plays an important part in this undertaking, and we take considerable pride in the fact that we were called upon to supply a Special Bronze Color Impervious Pressed Brick for this work, which for artistic appearance, durability and strength, has no equal.

We manufacture all colors of facing brick, also Fire Brick. Your enquiries for further details will be appreciated.

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GRANITE FOR PERMANENCE & BEAUTY

This was the idea which members of our Government had in mind when they selected

NELSON ISLAND GREY GRANITE

as the most desirable material from which to construct the new Buildings for the University of British Columbia.

In doing so, they had certain ideals in mind; they realized that they were building for generations to come and that permanent and beautiful buildings of dignified and classic architecture have much to do with the moulding of character in the youth of today—the business and professional men and women of tomorrow.

Therefore they selected the best building material available

NELSON ISLAND GREY

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VANCOUVER GRANITE CO. LTD.

VANCOUVER, B.C.

concrete slab, a P. & H. excavator was found efficient. A skinner bucket, pulled along the excavator's horizontal boom by means of a cable, rapidly cut off a comparatively thin layer where the old surface was somewhat too high, leaving the subgrade nearly a plane surface and not far from the desired contour.

At the mixer—a Koehring boom-and-bucket paver—the batch boxes were swung from the truck and dumped into the skip by a small derrick attached to the mixer frame.

Operations on the Trans-provincial highway in British Columbia—also concrete

Laying the last panel at Cloverdale

As soon as the concrete had been finished, it was protected from the hot sun by low, canvas covered frames. Later, straw, well sprinkled, kept the surface moist while the concrete was curing.

Securing water for this work was difficult as it was necessary to pump it five miles. A wooden tank was utilized as an intermediate station and a booster pump to send the water along from that point. The total lift was 300 feet.

In financing paved highways in British Columbia the usual plan is for the Dominion to contribute forty per cent. of the cost while the province and the municipalities concerned make up the remainder.

A. B. PALMER COMPANY, LIMITED
General Contractors

Pacific Highway, Cloverdale-Blaine Section, Looking South

Specialists in Road Building

DREDGING EXCAVATING GRADING

VANCOUVER, B.C.

WM. N. O'NEIL CO., LIMITED

Established 1899

Contractors for—

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Tile
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Work

Marble

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Tile Mantels

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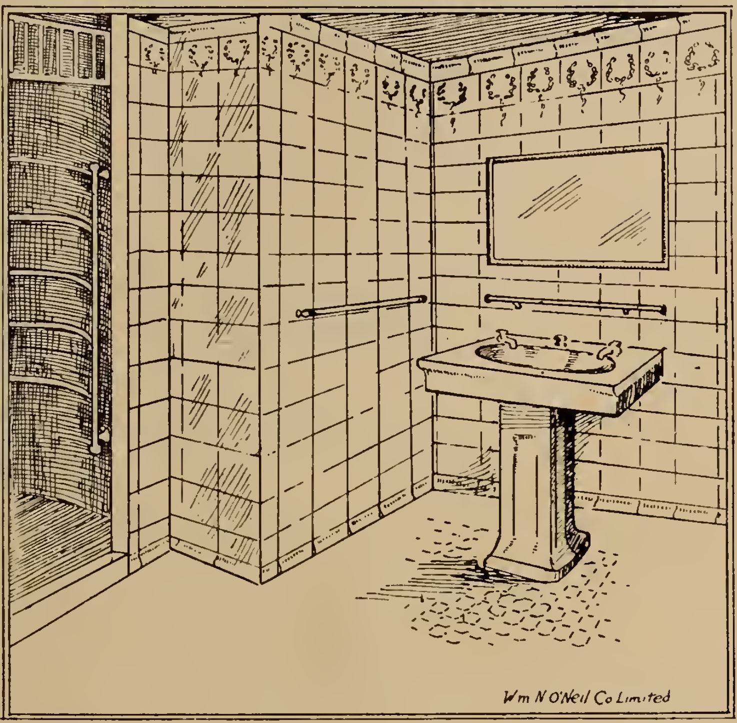
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We Carry in Stock—

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Figured, Art,
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Mirrors

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VANCOUVER
Phone: Sey. 4795**

Where We Stand On the Use of Trade Papers

The very first advertisement we placed when we started sixteen years ago was in a building trade paper.

It gave us no trade discount.

But it was a paying investment for our advertiser.

So they in turn paid us for having made it pay them.

As making advertising pay is what we are paid for, we use trade papers when it pays to use them.

Regrettably, some advertisers still cling to the idea that "trade papers are hold ups."

The most cursory investigation will prove them to be among to-day's most powerful business-building influences.

Sixteen years ago it proved basically sound to start our advertisers in trade papers.

It's even more sound practice to-day, whether you want to reach the architect, the hardware man, the electrical dealer or what not.

Let us start at the bottom with the trade papers and upbuild your business by their use.

Tuthill Advertising Agency

L. W. C. Tuthill, President
1133 BROADWAY
NEW YORK

E. J. RYAN Contracting Co.

General Contractors
for the
UNIVERSITY
OF BRITISH
COLUMBIA

HEAD OFFICE;

Fairfield Building, Vancouver, B.C.

CONSTRUCTIONAL ACTIVITY

Period of December 19 to December 25, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Brockville, Ont.

Work is to start at once laying sewers in Oak and Cedar streets.

Collingwood, Ont.

Town council contemplates an extension to waterworks, to cost $6,000, east side from present mains to G. & M. hospital. Work day labor to start this winter. Six-inch iron pipe with branches; hydrants for fire protection.

Durham, Ont.

James, Proctor & Redfern, Ltd., Toronto, are the engineers in charge of $100,000 waterworks system to be built here, which will include pumping station, collecting gallery, pumps, elevated tank, mains, etc. By-law in connection with this work is to be voted on January 7.

Hamilton, Ont.

The city council contemplates the laying of asphalt pavement on King street from Sanford avenue to Barton street, at a cost of $70,000. This includes the laying of track by Dominion Power Transmission Co. Engineer in charge of work is W. L. McFaul.

Montreal, Que.

The city council has awarded the contract for cast iron pipes to Canada Iron Foundries Co., Ltd., Three Rivers Que.

Tenders will be shortly called by the city council for the laying of sewers in various streets.

North Bay, Ont.

A By-law will be submitted to the ratepayers on January 7 for addition to reservoir at $7,000, and erection of septic tank costing $15,000.

Port Elgin, Ont.

The town council contemplates the installation of auxiliary waterworks pump. A committee has ben appointed to get prices and information on electrically driven pump. New boilers may also be required shortly.

St. Thomas, Ont.

The city council is having plans prepared for the laying of asphalt pavements on Meda street from Hiawatha street to St. Catherine street, including concrete curbs and gutters on both sides of street, to cost $4,000. Tenders for this work will be called in the spring. W. C. Miller is the engineer in charge of work.

CONTRACTS AWARDED

St. Martin Parish, Que.

Belanger & Sicotte, 83 Craig St. W., Montreal, have been awarded the contract for refection of macadam road at $4,881.88. This work will probably not start till the spring.

Somerset Sub Twp., Que.

Massicotte & Frigon, Plessisville, Que., have the general contract for gravel road on Levis-Sherbrooke route, at $27,524.27. This work will probably not start until spring.

Railroads, Bridges and Wharves

Chatham, Ont.

Pere Marquette Railway contemplate building a station here. Work will probably go ahead in the spring.

Pembroke, Ont.

Tenders are being received till January 9, by the Dept. of Public Works, through the secretary, L. H. Colman, Parliament Bldgs., Ottawa, Ont., for reconstruction of public wharf and dredging a basin and boat channel. Plans and specifications at department office of district engineer, Equity Bldg., Toronto, and at Post Offices, Pembroke and North Bay. A 10% accepted cheque required.

CONTRACTS AWARDED

Godmanchester Twp., Que.

O'Connor Bros., Co., Huntington, have been awarded the contract for refection of Tessier bridge on Caughnawaga-Malone, at $3,298.95. This work may not start until spring.

Petit Lac Magog, Que.

Kennedy Construction Co., Ltd., Montreal, Que., has the general contract for reinforced concrete bridge on Montreal-Sherbrooke Route, at 75,311.25.

St. Prosper, Que.

The town council has awarded Cauthier & Julien, Porteneuf Station, Que., the contract for steel bridge at $11,933. Engineer is Ivan E. Vallee, Parliament Bldgs., Quebec, Que.

Vancouver, B. C.

Work is to start at once for dredging and filling to cost $61,000 in connection with extension of C. P. R. pier "B. C.". General contract for dredging has been awarded to Northwestern Dredging Co., Ltd. On completion of dredging, Sydney E. Junkin Co., Ltd., general contractors, Winnipeg, will construct superstructure.

Public Buildings, Churches and Schools

Montreal, Que.

C. Davis Goodman, 14 St. John street, is preparing plans for extension to building on Mance street, owned by Montefiore Hebrew Orphans Home.

Trimming interior is in progress on $90,000 hospital being built for Souers de la Misericorde, 121 St. Hubert, Refrigerators, marble and tilting to be let. Architect, J. E. C. Daoust, 180 St. James St. General contractor, Ulric Boileu Ltd., 568 Garnier St.

Montreal North, Que.

J. David, 3 Burnside Place, Montreal, is preparing plans of $75,000 school to be erected here. Tenders on this work will be called early in March.

Mount Royal, Que.

The following sub-trades have been let on $12,000 church being built here for Church of England; electric—Sayer Electric; plumbing and heating—Reed Cambridge, care general contractors, Bremner Norris & Co.; plastering—Thos. Bibeau, 610 Chambord; ornamental iron —Canadian Welding Works, Ltd.; painting and glazing by general contractors; steel—McKinnon Steel Co., Ltd.

Outremont, Que.

Bigonesse & Bigonesse, 182 St. Catherine East, are preparing plans for $200,000 church to be erected here, owned by Parish Ste. Madeleine D'Outremont. Tenders will be called in February.

Rosetown, Sask.

A By-law for $50,000 addition to hospital here, was recently defeated by the ratepayers.

Riverside, Ont.

Pennington & Boyde, Windsor, Ont., are preparing plans of Catholic church to be erected here, estimated to cost from $30,000 to $50,000.

Sulley, Que.

The R. C. Parish contemplate erecting a church here to cost $50,000. Tenders for this work will shortly be called.

CONTRACTS AWARDED

Kingston, Ont.

The contract for ornamental iron in connection with erection of library building of Queens University, has been awarded to Geo. B. Meadows Co., Ltd., Toronto.

Ottawa, Ont.

Geo. Farmer, Bertrand St., has the contract for excavation work in connection with $294,797 addition to archives building. P. Lyall & Sons Construction Co., Ltd., Montreal, are the general contractors.

Toronto, Ont.

The following trades have been let on $15,000 church basement for Wanstead Ave Methodist Church; masonry—F. C. Elgie, 128 Merton St.; carpentry—Duckworth & Greenwood; steel—Hepburne & Disher; heating and plumbing— Alexander Ltd.; plastering—E. A. Murby, 209 DeGrassi St.; painting—F. G. Roberts &

Co, Ltd. Architect, A. W. Percival, 36 Toronto St.

Business Buildings and Industrial Plants

Burnaby, B. C.
Plans are being prepared for the erection of $100,000 saw mill on Fraser River waterfront. E. E. Phillips Lumber Co., Ltd., Burnaby, B. C., is the owner.

Exeter, Ont.
M. G. Ransford, Clinton, Ont., contemplates erecting a $20,000 salt plant here.

Eastview, Ont.
Ottawa Musical Clock Company contemplate building a factory here.

Hamilton, Ont.
Husband & Robertson, Merchants Bank Bldg., are preparing plans of warehouse to be built foot of John St., owned by Harbord Board.

Lauzon, Que.
Ed. Ruel, Ltd., 259 Commercial St., contemplate building a saw mill here to cost $20,000.

Niagara Falls, Ont.
Dominion Canners Ltd., St. Davids, Ont., contemplate building a canning factory here.

Newcastle, N. B.
Grading and laying of steel for 6 miles of narrow guage railway in connection with creosoting plant to be built here for Canada Creosoting Co., Ltd., Toronto, Ont., is being done by day labor under supervision of owners. Actual construction work will start in the spring.

Ottawa, Ont.
Foundation work is to start shortly for $10,000 store on Bank St., owned by G. Green, Bank and Fourth Ave. Tenders are being received till December 28 by the general contractors, Geo. Graves Construction Co., Jackson Bldg., for plastering, plumbing, painting, glazing, heating and electric.

Port Dover, Ont.
Al. Faulkner is owner of stores and lodge room, costing $10,000, to be built on Main St.

Stratford, Ont.
Jas. Russell, Downie St., is preparing plans of factory to be built here. Owner is J. McDonald, 220 Church St.

Toronto, Ont.
Alterations to building at 124 Adelaide West are in progress. R. Dack & Sons, Ltd., are the owners. Electric, plumbing and heating to be let by the architect, W. G. Hunt, Confederation Life Bldg.

Geo. Everall & Co., Ltd., contemplate an addition to their factory at 107 Jarvis St. Cost of work will be $11,000.

The walls are going up for $150,000 addition to lunch room at 11-13 King E. Tenders are being received by the general contractor, W. T. Joy, 86 High Park Ave., on roofing. Architects, N. A. Armstrong Co., Ltd.

Tenders addressed to the chairman, Toronto Transportation Commission, 34 Yonge St., will be received by the commission till January 4. for all trades in connection with brick maintenance shop, Hillcrest yard, Bathurst St., and Davenport Rd. Plans and specifications at Buildings Dept., 3rd floor, 35 Yonge St. Accepted bank cheque for 2½% of tender required.

Wright Bros., 1425 Yonge St., are the owners and builders of $35,000 addition to their shop at 1425 Yonge St. Masonry, plumbing and heating by owner's own staff. Carpentry by day labor. Ventilating, electric, plastering and painting trades to be let.

National Show Case Co., Ltd., 578 Queen East, is having plans prepared for an addition to their factory, Queen St., E., and Don Roadway. Tenders for this work will be called in the spring.

Vancouver, B. C.
Terminal Grain Co., Ltd., of Vancouver, contemplate the erection of a $2,500,000 grain elevator here. Work will probably start early in the new year.

CONTRACTS AWARDED

Bulwark, Alta.
General contract for $11,000 grain elevator to be built here for North Star Grain Co., Ltd., has been awarded to McCarroll Construction Co., Ltd., Winnipeg, who will purchase materials and elevator machinery.

Corbyville, Ont.
Work is in progress on distillery buildings owned by Canadian Industrial Alcohol Co., Ltd. Structural steel is being supplied by Canadian Bridge Co., Ltd., Walkerville; millwork—Pedlar People, Ltd., Montreal. T. Pringle & Son Ltd., are the engineers.

Ford, Ont.
The walls are going up for $35,000 bank building being erected for Provincial Bank of Canada. Painting by Rembrant Paint Shop, Walkerville; electrical work—Duncan & Moore, 1045 Louis Ave., Windsor. General contractor—Windsor Construction Co., Ltd., Walkerville; architect, G. J. P. Jacques, Windsor, Ont.

Work is in progress on coal bunker building being built for Ford Motor Car Co. of Canada, Ltd. The following trades have been let; miscellaneous iron—Border Wire & Iron Works, Walkerville; reinforced steel—Trussed Concrete Steel Co., Walkerville; millwork—Hadley Lumber Co., Chatham, Ont.; cement tile roof—Federal Tile Roofing Co., Chicago; painting and glazing—National Painters & Decorators, Windsor. General contractors—Jno V. Gray Construction Co.; architects—Albert Kahn Ltd.

Work is in progress for by-products building being erected for Ford Motor Company. Architects, Albert Kahn Ltd.; general contractors—Jno V. Gray Construction Co. The following Trades have been let: Steel sash—A. B. Ormsby Co. Ltd., 48 Abell St., Toronto; reinforced teel—Trussed Concrete Steel Co., Walkerville; millwork—Hadley Lumber Co., 47 Wellington W. Chatham, Ont.; cement tile roof—Federal Tile Roofing Co., Chicago, Ill.; painting & glazing—National Painting & Decorators, Wyandotte St. E., Windsor; roofing and sheet metal—A. W. Carmichael Co. Ltd., 90 Lincoln Rd., Walkerville; miscellaneous iron—T. J. Eastnor & Sons, Pitt St., E. Windsor; marble & terrazzo—Italian Mosaic & Tile Co. Ltd., 429 Spadina Ave., Toronto.

Montreal, Que.
D. F. Sheey, 9 St. Cecile St., has the general contract for $25,000 store to be built at 125 Mansfield St., owned by Estate Geo. Walker, St. James St. Millwork, roofing, electric, plumbing, plastering, painting, glazing, heating, ornamental iron and dum elevators to be let.

Peterborough, Ont.
Work is to start at once for addition to factory buildings to cost $7,000, owned by De Laval Co., Ltd. T. C. Ephgrave, 250 McDonnell St., is the general contractor.

Quebec, Que.
Work is to start shortly for stores, offices and warehouses to be built on Dalhousie St., at a total cost of $500,000, for Quebec Liquor Commission. Contract for foundations has been let to T. E. Rousseau Ltd., 229 St. Joseph St. Tenders to be called in January for balance of work. Associate architects, Wilfrid Lacrois, 132 St Peter St.; Oscar Beaule and J. A. Morrissette, both of 21 D'Aiguillon St.

Thousand Island Beach, Ont.
Contract for foundations for $200,000 hotel to be built near Gananoque, has been let to Mitchell & Wilson, Gananoque. Tenders for balance of work will be called in February. Owner is Royal St. Lawrence Hotel Co., Ltd. Architect, E. G. Bird, 6 King W., Toronto

Toronto, Ont.
Foundations are going in for $125,000 light manufacturing building at 207 Richmond West, owned by Gelber Bros., 217 Richmond West. Reinforced steel by Le Froy Engineering Co.; roofing, heating, plastering, electric, plumbing and painting trades to be let. Dowling & Williams, 167 Yonge St., are the general contractors. Architect, Benj. Brown, 287 Spadina Ave.

Foundations are going in for $6,500 service station at 1347-9 Quen E., for McBride & Creeny, 1345 Queen E. R. Travis, 117 Ashdale Ave., has the contract for masonry. Plastering, painting, electric, plumbing and heating to be let by owner.

Walter Davidson & Co., Ltd., 188 Duke St., has been awarded the general contract for repairs to building at 47 Front E., owned by F. W. Humphrey Co., Ltd.

Upper Bedford, Que.
James Shearer & Co.. Ltd., Montreal, are the general contractors for $20,000 addition to building of the Torrington Co., Ltd., Upper Bedford.

Vancouver, B. C.
Excavating work is being done for stores to be erected north west corner Robson and Thurlow Sts., at a cost of $11,000. General contract has been awarded to Dominion Construction Co., of Vancouver. J. W. Fordham Johnson, Point Grey, B. C., is the owner.

Windsor, Ont.
The walls are going up for $200,000 ice plant owned by Empire State Ice Co. Roofing contract has been let to Wind-

sor Reliable Asbestos Roofing Co. Blome Sinek Co., P. O. Box 38, Windsor, Ont., are the general contractors.

Winnipeg, Man.

Fonseca Roofing & Sheet Metal Co., Winnipeg, has contract for roofing and sheet metal trades on $40,000 woodworking factory being built here for G. W. Murray Co., Ltd. Millwork, plastering, painting, day labor by owners. Electric, plumbing and heating not yet let.

Residences

Hamilton, Ont.

Work has started on 2 residences, $8,000, on Ottawa street, south. Joe Vickers, 35 Elm St., is the owner and general contractor and will let trades.

Cartridge & Steer, 32 Balsam Ave., is owner and general contractor of 2 residences, $8,000 on East Ave. S., between Stinson and Webber. Plumbing and heating to be let.

Foundations are going in for 4 residences, $8,000, corner Cameron and Dunsmure Sts. H. J. McQuillan, 668 Main St. E., is the owner and builder, and will let trades.

Long Branch, Ont.

Wm. O'Donohue is having plans prepared for $8 000 residence and garage to be built at stop 28, Lake Shore Road.

London, Ont.

Geo. Everett, 637 Central Ave., is the owner and general contractor of $5,000 residence to be built on Piccadilly St.

Montreal, Que.

The frame is going up for 2 residences, $9,000, on Parthenais, between Bellechasse and Beaubien Sts. A. & R. Provost, 127 Iberville, are the owners and builders. Brickwork, roofing, electric, plumbing, plastering, painting and glazing trades to be let.

Foundations are in for $9,000 residence on Berri St., between Roy and Duluth. U. Riopel, 1702 St. Denis is the owner and builder. Sub-trades to be let.

Foundations are in for 2 residences, $10,000, on Old Orchard, near Montclair. N. Messier, 6481 Sacre Coeur, is the owner and builder. Sub-trades to be let.

P. E. Bourret, 294 Ste. Catherine E., is owner and builder of 3 stores and 21 flats, costing $60,000, Sherbrooke and Girouard. Sub-trades to be let. No materials purchased.

Foundations are in for $65,000 apartment house on Atwater Ave., near Comte. Atwater Construction Co. is the owner and builder. Sub-trades to be let.

The walls are up for 2 residences, $35,000, on St. Joseph Blvd., between Fabre and Garnier. Owner and builder is U. Boileau, 568 Garnier. Tiling, ornamental stair and balconies to be let.

U. Gagnon, 381 Fourth Ave., Ros., is owner and builder of 2 residences, $14,000, on Masson between 1st and 2nd Aves. Brickwork, millwork, roofing, electric, plumbing and plastering to be let.

Excavation work is being done for $10,000 residence on Bordeaux St., between Blvd. Ross and Bellechasse. C. Briand, 2593 Bordeaux St., is the owner. Masonry, roofing, electric, plumbing, plastering, painting and glazing trades to be let. No materials purchased.

Bigonesse & Bigonesse, 182 Ste. Catherine E., are preparing plans for 6 apartment houses, total cost $600,000, on Bleury between Sherbrooke and University.

Framework is going up for 2 residences, $17,000, on Notre Dame between Desormeaux and Mousseaux. Roofing, electric, plumbing, plastering, painting and glazing will probably be let.

Pick & Shepperd, 360 Hingston, are the owners and builders of 2 residences $20,000, on Grosvenor between Summerside and Queen Mary Sts. Brickwork, millwork, roofing, electric, plumbing, heating, plastering, painting and glazing to be let.

Excavation work is in progress for $18,000 residence on St. Denis St., between Isabeau and Belanger. C. Roberge, 3375 De Gaspe St., is the owner and builder. Plumbing, heating, plastering, painting and glazing by day labor. Masonry, roofing and electric to be let. No materials purchased.

Ottawa, Ont.

A. Stata, 209 Pretoria Ave., is owner and general contractor of $6,000 residence to be built on Grove Ave., who buys material. 9,000 bricks and material for 28 cu. yds. concrete and 800 sq. yds. plaster required.

Port Neuf Station, Que.

J. Ernest Papillon is owner of $5,000 residence to be built here.

Quebec, Que.

Lorenzo Auger, 39 St. John St., is preparing plans of duplex residence to be built corner Bougainville Ave., and St. Cyrille St., for W. R. Michaud, 15 St. Cyrille St.

Sandwich, Ont.

Harry Carcase, 163 Josephine St., is owner and general contractor of $5,500 residence being erected on Partington Ave. Plastering, electric and plumbing to be let. No materials purchased.

Toronto, Ont.

Foundations are going in for 1 single and 1 pair residences, $9,000, north side Soudan Ave., near Brownlow. Owner and builder is Robt. Luxton, 583 Pape Ave. Masonry by day labor. Plastering, plumbing, painting, heating and electric to be let by owner.

Footings are going in for 2 residences, $9,000 each, at 197-9 Dawlish Ave. Owner and bullder is Albert L. Sanagan, 3 St. Leonards Ave., who employs regular staff and buys material as required.

C. Brown, 80 King Edward Ave., is owner and builder of 3 residences, $12,000, west side King Edward Ave., near Barker.

Excavating work has been done for 2 residences, $4,500 each, at 475-7 Strathmore Blvd. C. Bennett, 849 Logan Ave., is the owner and builder. Plastering, painting, electric, plumbing and heating to be let.

W. Green, 241 Atlas Ave., is owner and builder of 2 residences, $8,000, east side Atlas Ave., near Vaughan Rd. Plastering, painting, electric, plumbing and heating to be let.

Work is to start shortly for 6 residences, total cost $90,000, west side Spadina Road. Roberts Bros., 241 Dovercourt Rd., are the owners. Architect, Neil G. Beggs, 6 Jean St. No materials purchased.

Foundations are in for $16,000 residence at 34 Thorncliffe Ave. Hawkins & Kelly, 681 Dovercourt Rd., are the owners and builders. Architect, J. G. Jacks, 232 Armadale Ave. Masonry by owners, day labor. Carpentry, day labor. Tenders are being received on plastering, painting, electric, heating and plumbing.

Johnson Bros., 111 Curzon St., contemplate building 1 pair residences, $7,000, east side Glenmount Park Rd., near Corley Ave.

T. B. Branson, 74 Aldwych Ave., is the owner and builder of 1 pair residences, $7,500, east side Elmer near Rhyll Ave. Masonry by day labor. Plastering, painting, electric, heating and plumbing to be let.

Footings are in for 2 residences and garage, $10,000, on Hopedale Ave. J. W. Fisher, 408 Glebemount Ave., is the owner and builder and employs own staff.

Tenders are being received by the owners, Grimshaw Bros., 2033 Yonge St., on plumbing for $15,000 residence being built east side Russell Hill Rd. near Frybrook Ave. Plans and specifications with owner.

Excavating work has been done for 2 single residences, $5,000 each, at 73-75 Duplex Ave. Owner and builder, North Toronto Homes Ltd., 15 St. Clair Ave., W. Plastering, painting, electric, heating and plumbing by owners own staff and buys material as required.

The walls are up for 6 pair residences, $7,000 a pair, south side Orchard View Blvd., near Duplex Ave. Grimshaw Bros., 2033 Yonge St., are the owners and builders, and are receiving tenders on all sub-trades.

Harry Stedman, 190 Northcliffe Blvd., is owner of 3 residences to be built on Gilbert Ave.

The foundations are going in for $15,000 residence and garage, north side Northcliffe and Rosemount. W. Wood, 46 Oakwood Ave., is owner and builder. Masonry by day labor. Tenders are being received on plastering, heating, electric, plumbing and painting.

Thorold, Ont.

Sam. Robinson, 54 Pine St., is owner of 3 cottages, $9,000, to be built on Ormond St., and is interested in prices on all material. Work may not start till spring.

Verdun, Que.

The foundations are going in for $12,000 residence on Third Ave. W. Proulx, 411 Gordon St., is the owner and builder. Masonry, roofing, electric, plumbing, plastering and painting to be let. No materials purchased.

Windsor, Ont.

Excavating work is being done for $7,500 residence on Dougal Ave. Winter & Williamson, Pitt St. W., are the owners and general contractors. Heating, electric, plastering and plumbing trades to be let. No material purchased.

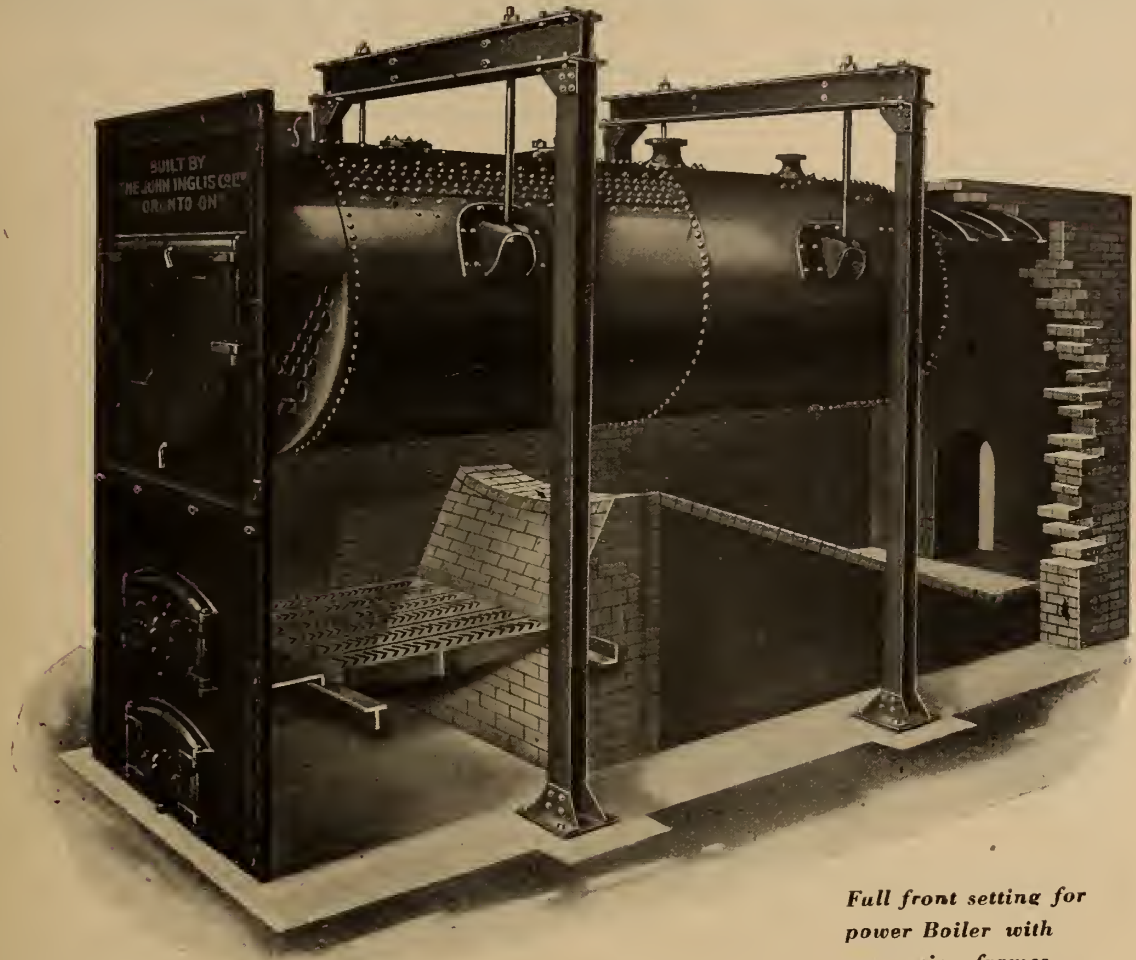
Fred Renaud, 1601 Giles Blvd., is owner and general contractor of $8,500 duplex residence on Giles Blvd. Heating, electric, plumbing, plastering and painting trades to be let.

CONTRACTS AWARDED

Aylmer, Que.

T. McLaughlin, Aylmer, Que., has the general contract for 20 residences, total

(Continued on page 180)



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Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Notice to Contractors

Sealed tenders marked "Tender for Contract No. 1018" will be received until 12 o'clock noon on

Monday, January 8th, 1924,

for the supply of approved one man field stone to be piled as directed alongside the Ottawa-Prescott Provincial Highway between the Jock River and a point 2¼ miles north.

Further information and tender envelopes may be obtained at the office of the undersigned or from A. L. Baldwin, Resident Engineer, Brockville, Ontario.

S. L. SQUIRE,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, December 17th, 1923. 52

Notice to Contractors

Sealed tenders marked "Tender for Contract No. 1016" will be received until 12 o'clock noon on

Monday, January 8th, 1924,

for the supply of approved one man field stone to be piled as directed alongside the Provincial Highway between Kincardine and a point three quarters (¾) mile east.

Further information and tender envelopes may be obtained at the office of the undersigned or from G. A. Downey, Resident Engineer, Walkerton, Ontario.

S. L. SQUIRE,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, December 17th, 1923. 52

Notice to Contractors

Sealed tenders marked "Tender for Contract No. 1017" will be received until 12 o'clock noon on

Monday, January 8th, 1924,

for the supply of approved one man field stone to be piled as directed alongside the Provincial Highway between Lancaster and a point five (5) miles east.

Further information and tender envelopes may be obtained at the office of the undersigned or from A. H. Parker, Resident Engineer, Cornwall, Ontario.

S. L. SQUIRE,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, December 17th, 1923. 52

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Sealed tenders addressed to the undersigned, and endorsed "Tender for wharf reconstruction and dredging, at Pembroke, Ont.," will be received at this office until 12 o'clock noon,

Wednesday, January 9, 1924,

for the reconstruction of a public wharf and dredging a basin and boat channel, at Pembroke, County of Renfrew, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the office of the District Engineer, Equity Building, Toronto, Ont., and at the Post Offices, Pembroke, Ont., and North Bay, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $25.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
L. H. COLMAN,
Secretary.
Department of Public Works,
Ottawa, December 17, 1923 51-52

The Electrician gives an account of a peculiar accident which recently occurred on one of the single-phase locomotives on the St. Gothard Railway. It appears that the core and coils of the main transformer were taken out for inspection, and it is assumed that in replacing them the winding became damaged or that some foreign metal was dropped into the tank. In any event a day or two afterwards a heavy internal short circuit occurred which generated hydrogen and methane. These escaped from the tank, and finding their way on to the contactors were ignited. This type of accident is to be avoided in future by the use of a relief pipe, which will carry all the gases on to the roof, while an air-tight seal is to be provided between the transformer and contactor compartments.

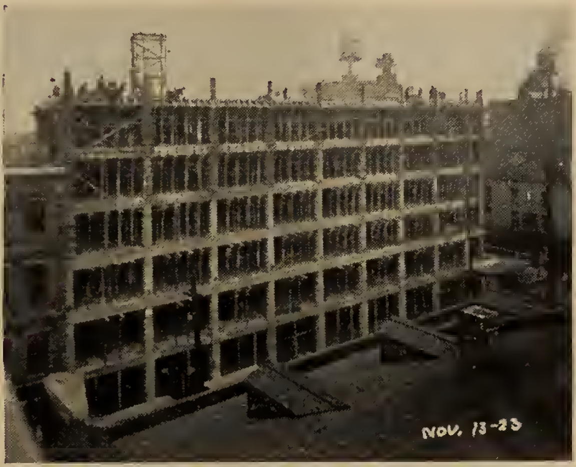
The value of interconnection between large power transmission systems is exemplified by an incident which recently happened in the U. S. The small reservoir of the Alabama Power Company on the Coosa River was full, and so could not conserve a flood flow. The flow could be utilized, if at all, only as it came down the river; but away off to the east, on the eastern slope of the Piedmont Plateau, the reservoir of the Carolina Power and Light Company, on the Pee Dee River, had been drawn down, and an insufficient stream flow meant a shutting down, or at least curtailing of output, of the many cotton mills dependent on this water power. Consequently, for a time the turbine gates on the Pee Dee River were closed; and while the reservoir was thus allowed to be replenished, the load of the company was carried by power relayed to it by the Southern Power Company, which in turn, received it from the Georgia Railway and Power Company, to whom is was delivered by the Alabama Power Company.

Liquid oxygen explosive has been successfully used in Colorado by the Department of the Interior in experimental mine blasting and road construction work at a cost of, approximately, one-half that of the gelatin dynamite required to do the same work. The experiments were conducted by E. D. Gardner, Mining Engineer of the American Bureau of Mines, in co-operation with a representative of the Compressed Air Corporation. A liquid oxygen explosive consists of gas black, wood pulp, or some other carbonaceous material made up into cartridges and soaked in liquid oxygen. This explosive can be detonated similar to ordinary dynamite with cap and fuse, or with electric detonators. The liquid oxygen was obtained from a plant designed to furnish oxygen gas, and was shipped to the point of use in Dewar flasks.

The recently completed dam at the Great Lake, Tasmania, has a height of 40 ft., and provides a storage of 312,500 million gallons over an area of 60 square miles, which, it is claimed, makes it the fourth largest reservoir in the world. The power plant is already of 50,000 horsepower capacity, and is to be extended by another 10,000 horsepower.

BURLINGTON STEEL COMPANY LTD.

Hamilton, Canada



Lister Building 138′ x 100′ Six Storeys, Hamilton, Ont.

Bernard H. Prack,
Architect.

Pigott-Healy Construction Co.,
Contractors.

Service Counts

Reinforced Concrete Work on above building was completed in 37½ actual working days. This could only have been accomplished by the prompt and satisfactory service given by the Burlington Steel Company who furnished 225 tons RAIL STEEL BARS for this construction. Pigott-Healy state in their circular entitled "Speed in Reinforced Concrete Construction" which is a description of the Lister Building:-

"To the Burlington Steel Company who so arranged their material for us that they were on the job each week with column steel Tuesdays, beam steel Wednesdays, and the slab steel Thursdays, perfectly bundled, without delay, we are very much indebted."

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Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Specify your reinforcing steel to meet ASTM Specification A-16-14 or Canadian Engineering Standards Association A-9-1923-B.

Residences

(Continued from page 178)

cost $60,000, to be built on several streets here.

Montreal, Que.

Painting and glazing contract $20,000 residence being built on Courte between Fort and Chomedy, has been let to A. R. Lambert, care general contractor, A. K. Hutchison, 10 Cathcart St. J. R. Douglas, Canada Cement Bldg., is the owner.

H. Capra, 2795 Drolet St., has the contract for tiling on 3 flats, $14,000 being built on St. Urbain St. near Villeneuve, for Louis Averbach, 74 Villeneuve. B. Kaplan, 1016 St. Urbain St., has the general contract. Painting and glazing to be let.

H. Beloff, 68 Duluth Ave., has the contract for roofing of $60,000 apartment house being built near 462 McKay St., owned by M. Maron, 1195 St. Urbain St. Painting and glazing, tiling and ornamental iron to be let. Architect, H. Potvin, 26 St. James St.

P. Boileau, 239 Mt. Royal West, has the general contract for $12,000 cottage being built on Bloomfield near Bernard, for E. Z. Leblanc, 1312 St. Hubert St. Sub-trades to be let.

Ottawa, Ont.

H. L. Allen has the contract for electrical work, and F. Bronke, Hurdmans Bridge, the plumbing and heating in connection with $5,000 residence being built on Farraday Ave. for J. F. Keller, 139 Farraday Ave,, the owner and general contractor.

The walls are going up for $8,000 residence on Powell Ave., for David Arbuckle, 215 Argyle Ave. Following subtrades have been let; electric—H. L. Allen; plumbing and heating—F. Bronke, Hurdmans Bridge; plastering—A. Tessier; painting by day labor.

The following sub-trades have been let on stores and apartments, $12,000, being built on Bank St., for H. Brouse, 105 Sparks St.; galvanized iron—J. Shepperd; roofing—J. Sanderson & Sons; electric—H. L. Allen; plastering—Murphy & Morrow, Billings Bridge; heating and painting by day labor. Supervisor is Geo. Grain, Clemow Ave.

Port Credit, Ont.

F. W. Kirk, 205 Charlton West, Hamilton, Ont., has the contract for painting of $30,000 store and residence, corner Toronto and Anne Sts., for R. Skinner, Schomberg, Ont. Duro Construction Co., Hamilton, is the general contractor.

Port Dover, Ont.

The following trades have been let on $5,000 store and residence being built on Main St.; electric—Harry Young; plumbing and heating—McQueen & Co.; plastering—S. Morrell; flooring and interior trim—Nunn Bros. Geo. V. Phillips is the owner and builder.

Toronto, Ont.

The walls are going up for 1 pair residences, $7,500, north side Milverton Blvd., near Coxwell Ave. Owner and builder—Gilbert & Richards, 235 Wolverleigh Blvd. Electric and plastering to be let. Plumbing—A. Millar, 78 Kingsmount Park Rd.; heating—Howard Furnace Co. Painting by day labor.

Walls are going up for residence being built at 36 Thorncliffe Ave., for Miss E. Jacks, 232 Armadale Ave. Masonry—Hawkins & Kelly, 681 Dovercourt Rd.; heating—Peerless Furnace Co.; plumbing—Shearer & Russell. Carpentry by day labor. Tenders are being received on plastering, painting and electric.

W. A. Hoad, 24 Norway Ave., has the contract for plumbing, and Toronto Furnace Co., the heating in connection with 1 pair residences, $7,000, east side Haslett, near Rhyll Ave. Owner and builder is I. Schofield, 33 Haslett Ave. Masonry by day labor.

Power Plants, Electricity and Telephones

Cabri, Sask.

By-law was recently passed by the ratepayers approving erection of electric light plant to cost $14,000.

St. Paulin, Que.

Plans have been drawn for $2,500,000 water power development on River du Loup En Haut, for Algonquin Power Co., Montreal. Tenders on this work will be received by the engineers, J. M. Robertson Ltd., St. Nicholas St., Montreal, till December 31.

Lake Kenogami, Que.

Canadian Vickers Ltd., Montreal, Que., is supplying the structural steel in connection with $1,800,000 storage dams being built for the Quebec Streams Commission, Montreal. Balance of work to be done by the general contractor, Nova Scotia Construction Co., Montreal. Chief engineer is O. Lefevbre.

St. Jerome, Que.

Canadian Comstock Co. Ltd., have secured the contract for the electrical equipment and construction work, in connection with power house of J. C. Wilson Ltd., on their hydro-electric development here. Beaubien, Busfield & Co. are the consulting engineers.

SUPPLY BONDS
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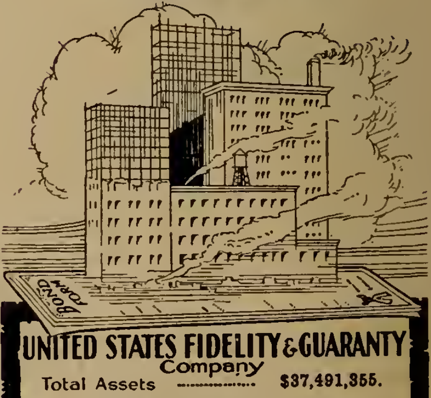

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W.R.KIRKPATRICK
Canadian Secretary

MACADAM ROADS

Repairs

Holes that develop in treated macadam surfaces must be repaired quickly so that they may not increase unduly in size. Sweep out loose material from the hole, and, if it is only a surface break, paint the hole with "Tarvia-B". Cover with chips or gravel. Do not make a puddle of "Tarvia-B" in the hole because this will make a soft patch that will wave and creep out of place.

If the hole is deep, or extensive, it should be patched as described on page 48, "How to Patch with Tarvia."

During the winter, ruts may be formed by chains on the wheels of motor vehicles. A succession of motor trucks equipped with chains will wear through any surface treatment, if the vehicles keep in the same track. Repairs must be made at the earliest moment, whenever the snow is off the road and the road is dry enough to take a treatment. If the ruts are shallow, it is only necessary to sweep off loose material, paint-coat the rut with "Tarvia-B", and cover with chips or pea-gravel. If the ruts are deep, repair them as described on page 48, "How to Patch with Tarvia"

Maintenance

While with gravel roads a yearly treatment is necessary to keep the road in first class condition, with macadam it is not always advisable to treat every year. It is often well to skip a year, so that a mat coat is not built up. As a rule, all treatments subsequent to the first are less in quantity. Some of the most successful highways that are surface-treated with Tarvia receive less than ⅓ gallon per yard per year. When such small amounts are applied there is no danger of a mat surface being built up.

Before each treatment see that all ruts, holes and depressions are patched satisfactorily. A maintenance surface-treatment will not put a poorly repaired road in perfect condition.

14

TARVIA RESURFACING

By resurfacing is meant the construction of a wearing course over an old road or pavement. The old material serves as a foundation for the new top and a great saving is thereby effected. There are thousands of miles of old macadam, concrete and other types that can be salvaged by resurfacing with 2½" Tarvia top.

Old macadam ready for resurfacing.

"TARVIA-X" CONSTRUCTION

1. In the case of old macadam or gravel roads, it may be necessary to scarify to a depth of 3", and roll to an even surface. With most pavements it is sufficient to patch holes and ruts with stone and Tarvia (See page 48).

2. Spread a 3" layer of 1½" clean, tough, hard stone.

3. Roll with a heavy roller to a true and even surface.

4. Apply "Tarvia-X" at the rate of 1.7 gallons per square yard.

Scarifying.

Applying "Tarvia-X"

Spreading Cover.

15

A prominent engineer writes:
"Your 'Maintenance Manual' is the most constructive piece of road literature that has come to my attention in years. Congratulations."

A Road Maintenance Manual Every Engineer Should Have

Road authorities know that eternal maintenance is the price of good roads; that haphazard patching and treating of highways is more costly in the long run than a system of regular upkeep.

This manual shows how every type of road and pavement, except earth roads, can be easily repaired and maintained with Tarvia.

Whether or not you use Tarvia, this booklet will prove of great benefit to you in your work. "Road Maintenance with Tarvia" is recognized by engineers and road authorities as the most complete and helpful booklet on road maintenance that has ever been published.

A copy will be gladly sent free on request to our nearest branch office. As the number of copies is limited, we suggest that you write for your copy today.

WINNIPEG VANCOUVER
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MONTREAL TORONTO
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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags, delivered	per bbl.	$4.60	$4.16	$5.00	$4.30
Car lots, including bags, f.o.b. siding	per bbl.	3.45*	3.48	4.20	4.20
Refund on bags	each	.20	.20	.20	.20
LIME					
Lump, in retail lots, delivered	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots f.o.b. siding	per ton	11.80	9.50	13.80 ton*	2.60 bbl
Hydrated, white in retail lots, delivered	per ton	20.00	26.00	.63 bag†	22.00
Hydrated, white in car lots, f.o.b. siding	per ton	18.00	21.00	.56 bag†	18.00
Hydrated, grey in retail lots, delivered	per ton	18.75	19.00		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	23.00
No. 1 dry pressed brick	per M.	30.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	28.50	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	19.00
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	68-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	1.84		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.05	1.50	2.75 "	" "
Sand, screened	per ton	1.26½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base†	4.00 base	4.90	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.50 "	5.40 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.45	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.35 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.45	6.25
Plates—3/16 in.	per 100 lbs.	4.25 "	4.25 "	5.85	6.50
Plates—10 gauge	per 100 lbs.	4.60 "	4.50 "	6.15	6.50
Black sheets—28 gauge	per 100 lbs.	5.60 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.75 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.50 base	
Cast iron pipe	per ton	67.50	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.40	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
Chimney tops	each	9.00	14.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days from date of shipment.
LIME:—*Discount of 5%. †Bag of 50 lbs
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.
STEEL:—†Extras in various steel lines were alvanced recently. New list may be hal on application to dealers.
VITRIFIED CLAY PRODUCTS:—.Discount on flue linings is 55%

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	80.00	63.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	56.00	43.00
Flooring, No. 1 pine	per M.	75.00	80.00		
Flooring, No. 1 Spruce	per M.	52.00	45.00		
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	156.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	120.00	125.00	136.00	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	56.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	40.00	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	36.00	
Hemlock, 2 x 4 to 12 in.	per M.	41/45	40.00	36.00	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	45/60	50.00	35.20	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	36.00	
Timbers, fir, 10 x 10 in. and up	per M.	65.00	58.00	53.60 base	17.-22.00
Lath, No. 1 white pine	per M.	13.50	12.00	11.20	
Lath, M. R. spruce	per M.	9.50	8.50	8.40	7.00
Shingles, XXX B.C. cedar	per M.	6.00	5.00	5.60	3.25
XX B.C. cedar	per M.	4.50	4.25	3.20	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	105.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	16.00
Putty in bulk	per cwt.	5.95	4.25	5.25	7.75
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.20	1.40	1.30	1.46
Raw linseed oil, in bbls.	per gal.	1.17	1.38	1.33	1.43
Turpentine, in bbls.	per gal.	1.50	2.20	1.70	2.25
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	26.00	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu*	-.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.10	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	.90	1.00
Plasterers	per hr.	1.25	.80	1.07½	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.85-1.00	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.85	.81¼
Painters	per hr.	.75	.55–.65	.75	81¼
Electrical Workers	per hr.	.80	.65	.65- .85	1.00
Roofers	per hr.	.65	.65	.50	.90
Laborers (Common)	per hr.	.40–.50	.30	.42½	.50-.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

PLASTER:—*Including bags. † 10c. extra for bags.

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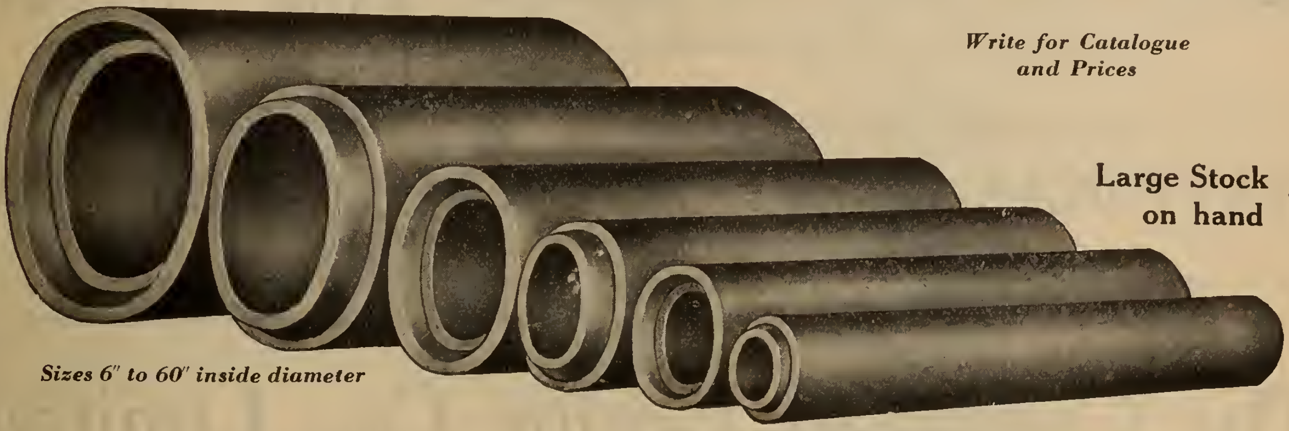

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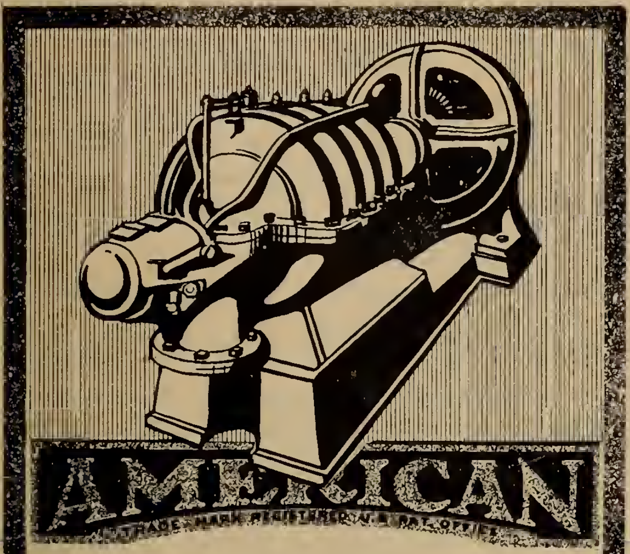
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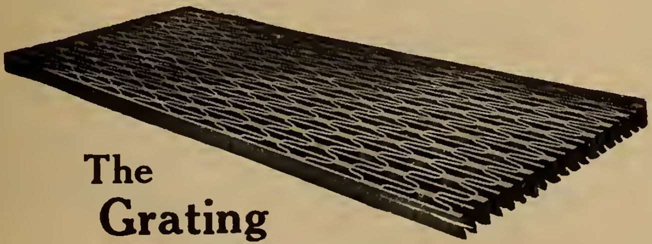
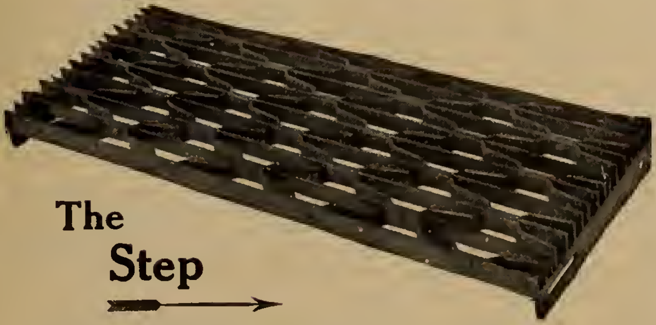


The Grating



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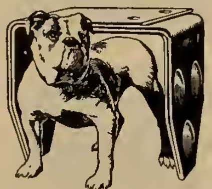

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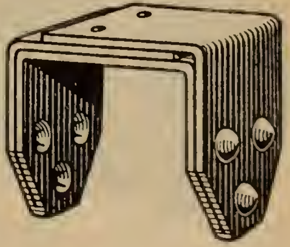

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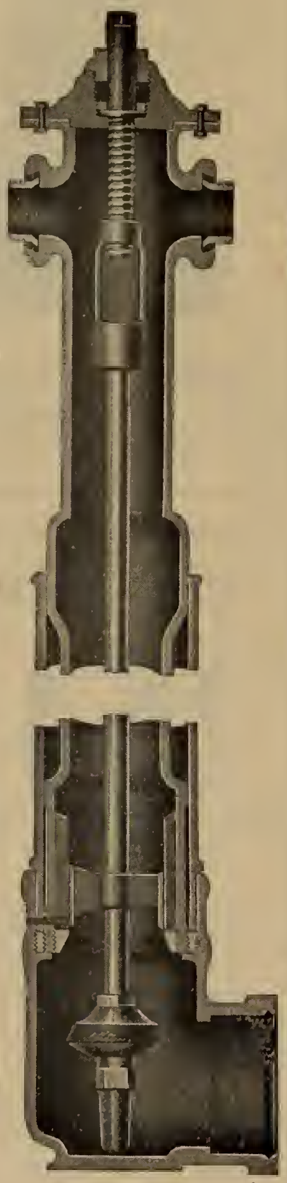

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Item 4017	40	"Sullivan" Tripod Drills—Type FP-3.
Item 4021	5	"Canadian Ingersoll Rand" Tripod Drills—Type LG54.
Item 4022	8	"Canadian Ingersoll Rand Tripod Drills—Type LG53¼.
Item 4018	50	"Sullivan" Hammer Drills—Type DP33.
Item 4019	10	"Canadian Ingersoll Rand" Jackhamers BCR-430.
Item 4020	15	"Canadian Ingersoll Rand" Jackhamers DDR-13.
Item 4023	12	"Oldham" Plug Drills—Type L.

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Item 3007	6	"Marsh Engineering Works" Electric Hoists—Double Drum—with 75 H.P. Motors.
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DEPARTMENT OF LABOUR
BOILER INSPECTION NOTICE
Excerpt from Regulations for the Construction and Inspection of Boilers
Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.
The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.
All communications should be addressed to the Steam Boiler Branch. Department of Labour, Spadina Crescent.

HON. Dr. FORBES GODFREY,
Minister of Labour.
D. M. MEDCALF, Chief Inspector of Steam Boilers.

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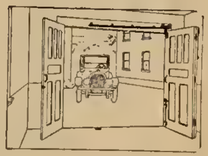

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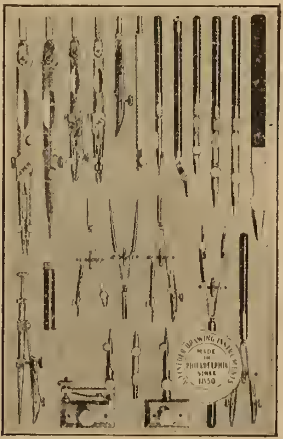

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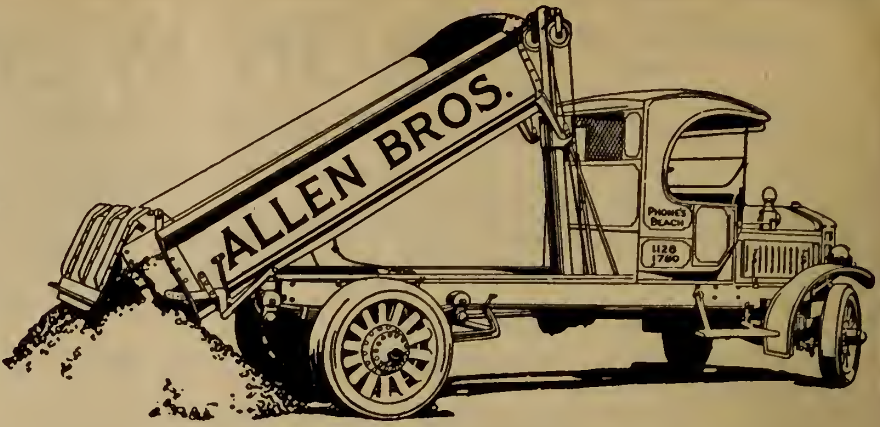

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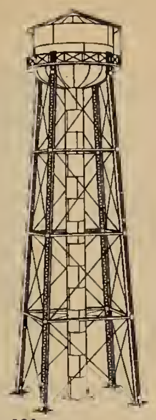
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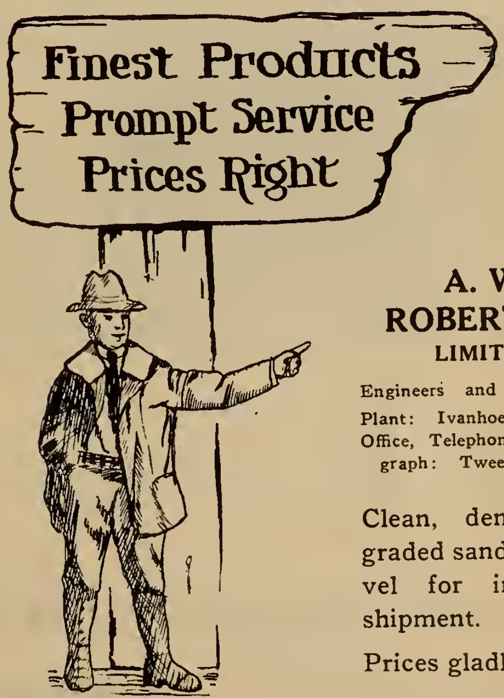

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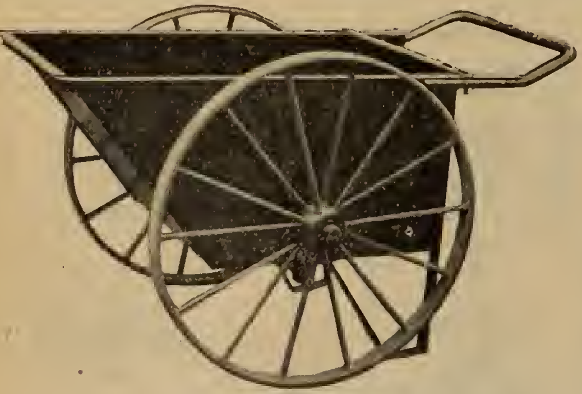

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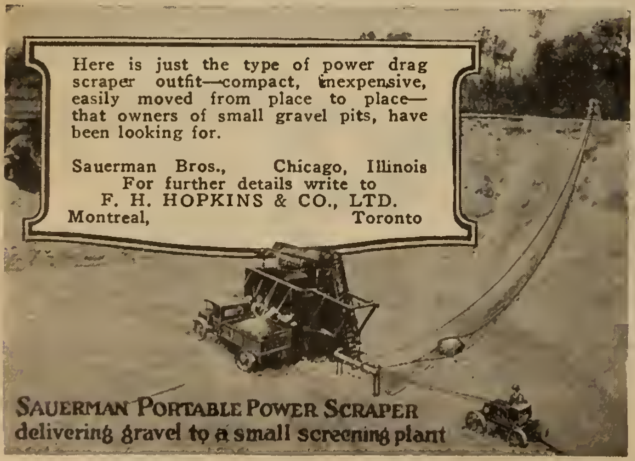

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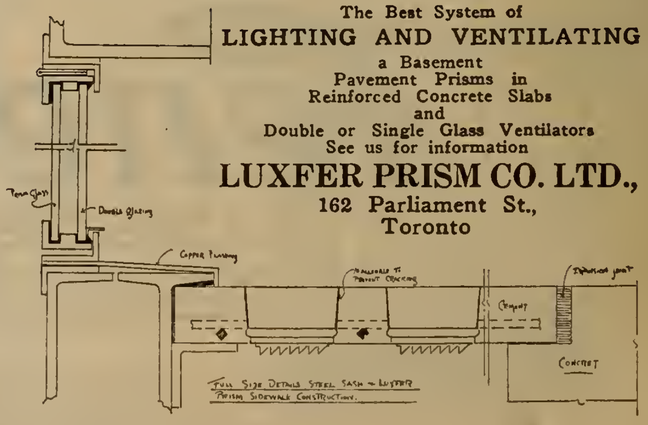

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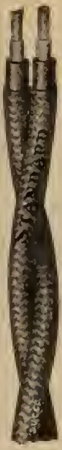

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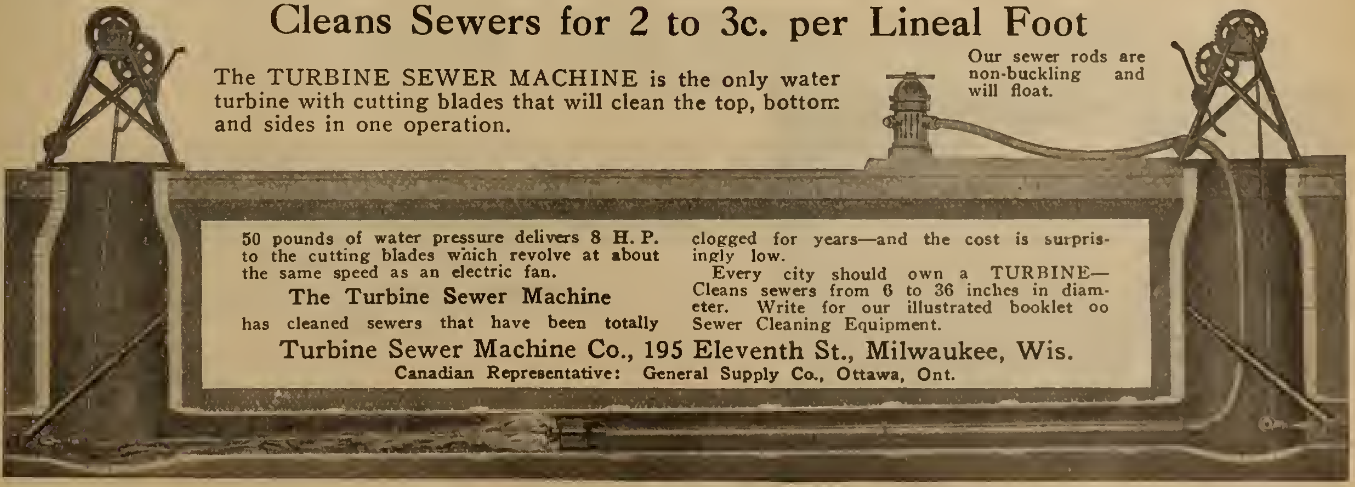

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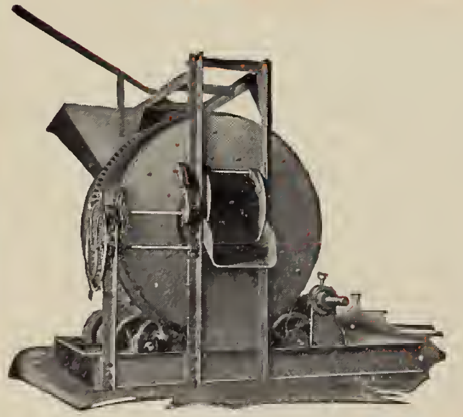

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